



instruction book

32S-3 Transmitter

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SECTION 1
Installation

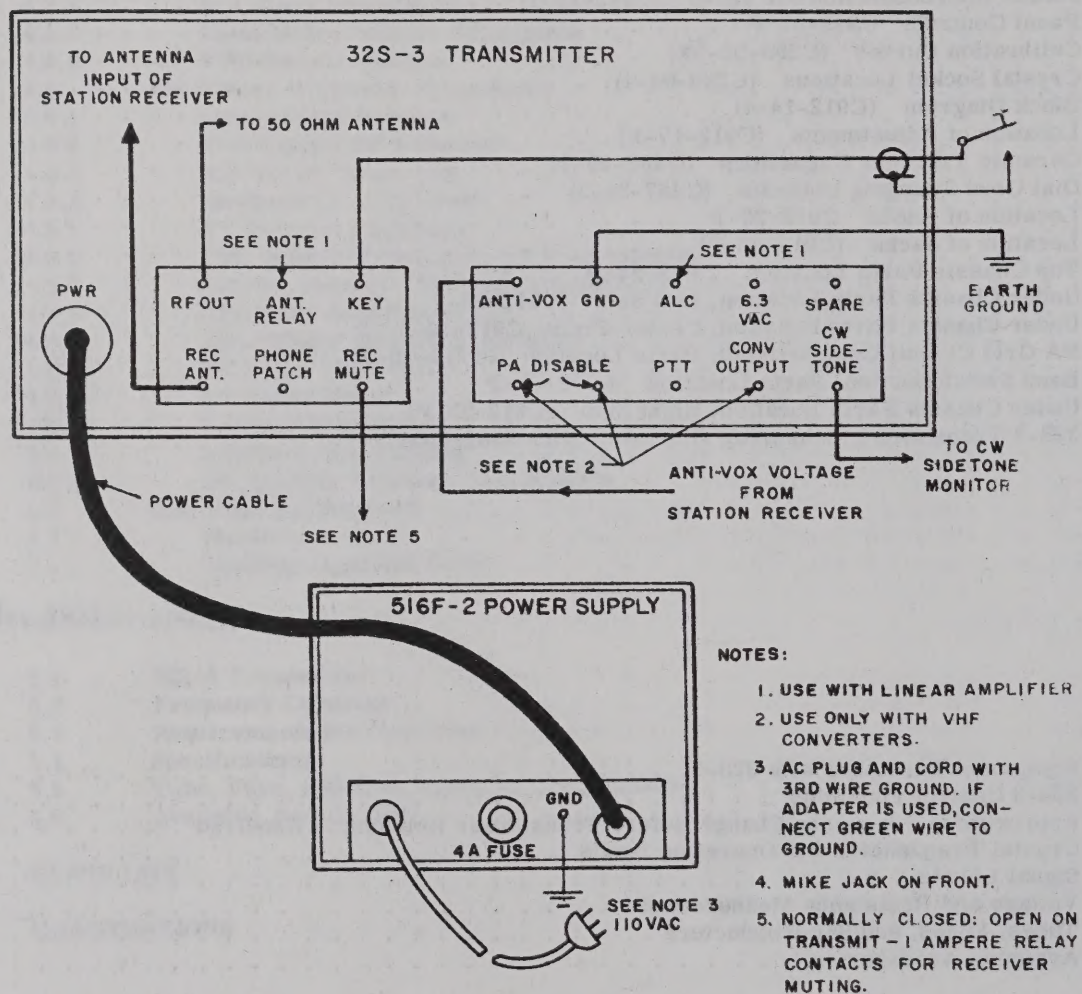


Figure 1-1. External Connections

section 1

installation

1.1 Unpacking.

Carefully lift the transmitter out of the packing material. Examine for visible damage. If transmitter has been damaged in shipment, save box and packing material, and notify the transportation company. Fill out and mail the guarantee card. Check that all tubes and crystals are properly seated in sockets. Check tuning controls and switches for freedom of action.

1.2 Mounting and Cabling.

CAUTION

The 32S-3 must be operated into a 50-ohm load with an swr not exceeding 2.0:1. Random-length wire antennas or "light-bulb" dummy loads cannot be used nor can a conventional

half-wave dipole or beam antenna be used except very near its resonant frequency. Exceeding an swr of 2.0:1 can destroy the components in the output stage of the transmitter.

Connect transmitter to receiver, power supply, and antenna as shown in figures 1-1, 1-2, or 1-3. Using the GND lug shown in figure 1-1, connect the transmitter to a good earth ground, such as a metal water pipe or a metal stake driven deep into moist soil. The RG-58C/U cables may be identified by their slightly larger diameter and 2-inch shorter length. Use the rf cables where shown. The smaller microphone cables are satisfactory for af or control functions.

Connect microphone or key as shown in figure 1-1. The 32S-3 is connected for use with a high-impedance phone patch, such as the one in the 312B-4 Station Control.

TABLE 1-1. EQUIPMENT FURNISHED WITH 32S-3

QUANTITY	DESCRIPTION	FUNCTION	COLLINS PART NUMBER
1	Log book	Station logging	523-0755-820
1	Instruction book	32S-3 instructions	523-0755011
3	Coaxial cables with phono plug on each end, 4 feet long	For interconnection of vfo, crystal oscillator, and antenna between 32S-3 and 75S-().	426-5076-00
1	Phono plug	Antenna connector	361-0062-00
1	Microphone plug	Microphone connection	361-0001-00
3	Shielded cables with phono plug on each end, 4 feet long	Patch cables for nonrf circuits between 32S-3, receiver, and linear amplifier.	426-2027-00
1	Marker card	Identify cable interconnections.	280-2946-00
1	Socket head screw key no. 4	Accessory tool	024-2900-00
1	Socket head screw key no. 6	Accessory tool	024-9730-00
1	Socket head screw key no. 8	Accessory tool	024-0019-00
1	Socket head screw key no. 10	Accessory tool	024-9710-00

SECTION 1
Installation

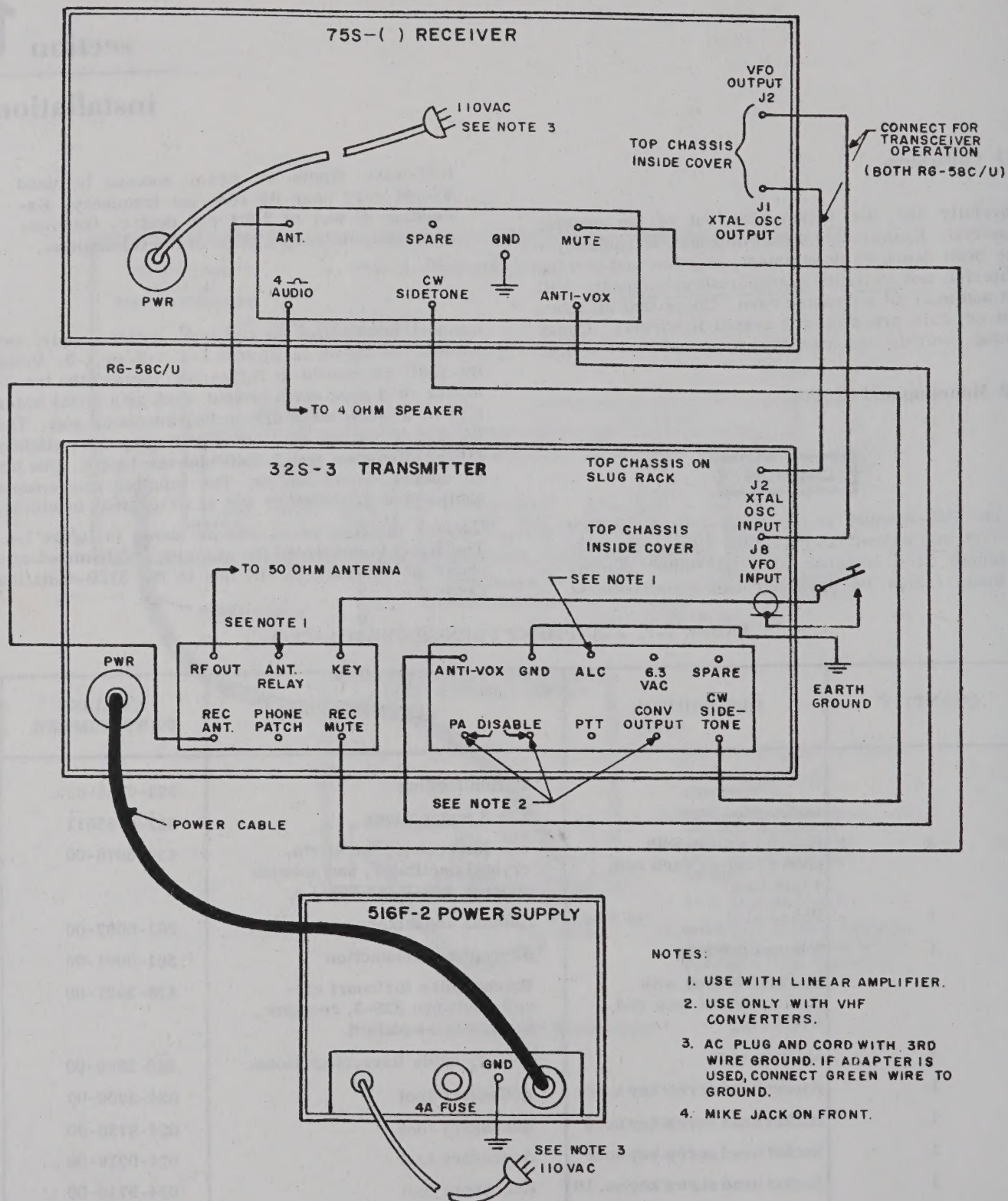


Figure 1-2. Receiver-Transmitter Interconnections

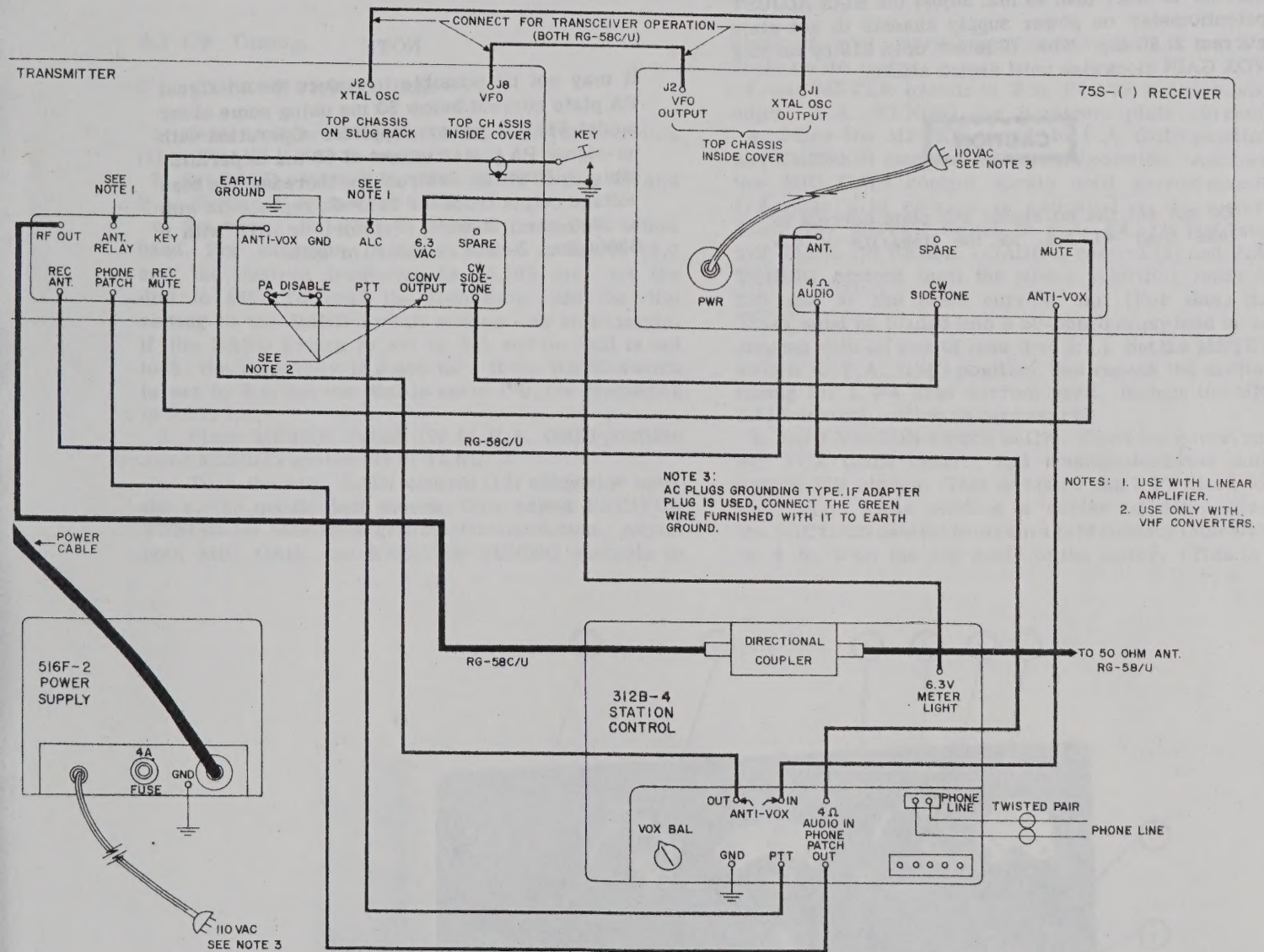


Figure 1-3. Station Interconnection for 32S-3

SECTION 1

Installation

1.3 Initial Checks.

Set MIC GAIN control fully counterclockwise, FREQ CONTROL switch to TRANS VFO, EMISSION switch to USB or LSB. Open top of transmitter, and set VOX GAIN control fully counterclockwise until switch S10 (PTT ON) closes. Set METER switch to P.A. PLATE position, and read the no-signal PA plate current. It should be approximately 40 ma. If plate current is other than 40 ma, adjust the BIAS ADJUST potentiometer on power supply chassis to set plate current at 40 ma. When finished, open S10 by turning VOX GAIN clockwise until switch clicks.

CAUTION

Do not set the no-signal PA plate current to less than 40 ma, as the linearity of the

amplifier will be degraded. Do not set the no-signal plate current to more than 50 ma, as the PA plate dissipation capability will be exceeded and the tubes damaged.

NOTE

It may not be possible to reduce the no-signal PA plate current below 50 ma using some older model 516F-2 power supplies. Operation with no-signal PA plate current of 50 ma is permissible. If it is desired to increase the bias voltage output from the 516F-2, replace R8 with a 3900-ohm, 2-watt resistor, or R10 with a 6800-ohm, 2-watt resistor, or both.

section 2

operation

2.1 CW Tuning.

2.1.1 TUNEUP PROCEDURE.

- a. Refer to figure 2-1. Set **FREQ CONTROL** switch (1) to **TRANS VFO**. See table 2-1.
- b. Set **BAND** switch (11), **EXCITER TUNING** (2), and **P.A. Tuning** (4) to desired band.
- c. Set tuning dial (10) to desired frequency within band. For example, if **BAND** switch is set to 14.0 and the desired frequency is 14.195 mc, set the dial to 195. To read the frequency, add the dial setting to the **BAND** switch setting. As an example, if the **BAND** switch is set to 3.8 and the dial is set to 5, the frequency is 3.805 mc. If the **BAND** switch is set to 3.8 and the dial is set to 170, the frequency is 3.970 mc.
- d. Place **METER** switch (7) to **P.A. GRID** position and **EMISSION** switch (9) to **TUNE**.
- e. Turn the **MIC GAIN** control (12) clockwise until the meter needle just moves, then adjust **EXCITER TUNING** for maximum grid current indication. Adjust both **MIC GAIN** and **EXCITER TUNING** controls to

obtain a grid current peak of between 1/2 and 3/4 scale on the meter.

f. Set **METER** switch to **P.A. PLATE** position, and adjust **P.A. TUNING** for minimum plate current.

g. Place the **METER** switch to **P.A. GRID** position and **EMISSION** switch to **LOCK KEY** position. Advance the **MIC GAIN** control slowly until approximately 1/2-scale grid current is indicated on the meter. Place the **METER** switch to **P.A. PLATE** position, and adjust **INCREASE LOADING** control (5) and **P.A. TUNING** control until the power amplifier loads to 230 ma at the plate current dip. (For this, the 32S-3 must be loaded into a 50-ohm dummy load or an antenna with an swr of less than 2:1.) Set the **METER** switch to **P.A. GRID** position, and repeak the exciter tuning for a PA grid current peak. Reduce the **MIC GAIN** control setting as necessary.

h. Set **EMISSION** switch to **CW**. Open top cover, and set **VOX GAIN** control full counterclockwise until switch S10 closes. This actuates the **PTT** (push-to-talk) line. While sending a series of dots, adjust the **MIC GAIN** control to obtain a grid current indication of 4 to 5 on the **DB** scale of the meter. (This is a

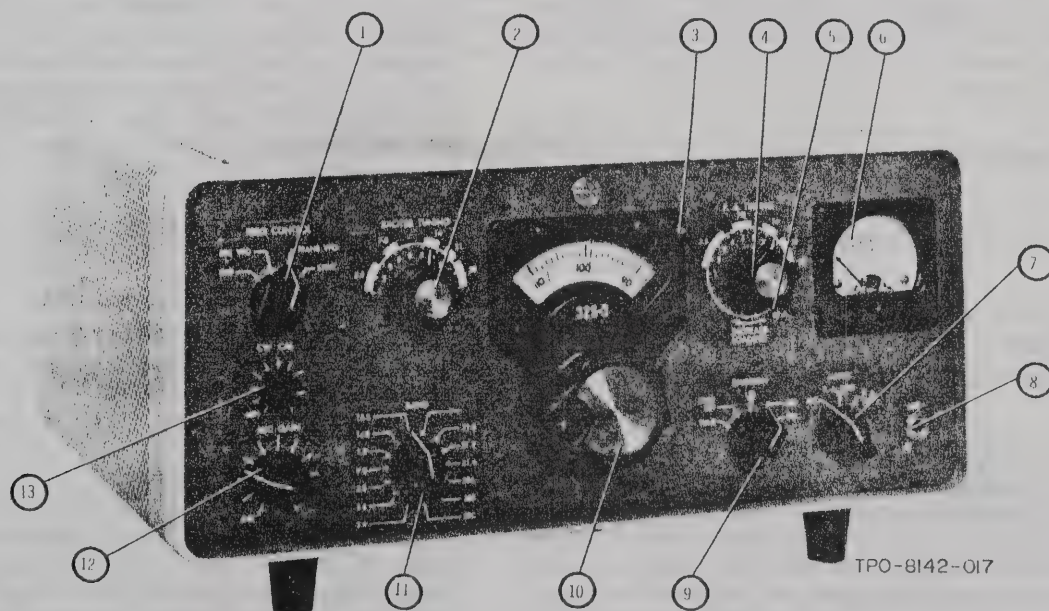


Figure 2-1. Panel Controls

SECTION 2

Operation

relative indication and does not signify a specific number of milliamperes.) (Be sure that the METER switch is set to P.A. GRID.) Open switch S10 by turning VOX GAIN control clockwise until the switch clicks.

2.1.2 BREAK-IN OPERATION.

a. Open the top cover, and turn the VOX GAIN control clockwise until the vox relay operates with the key. If it is desired to change the relay hold time, adjust VOX TIME CONST control R86. Clockwise rotation of this control increases the hold time. This control is located on a bracket under the top cover.

b. For rapid, nonbreak-in CW, connect an external hand or foot switch to PTT jack J4.

2.1.3 ADJUSTMENT OF KEYING WAVESHAPE.

The keying waveshape control is located inside the top cover and is a screwdriver adjustment. In the extreme clockwise position, the keying shape rise and decay times are maximum, and the emitted wave will be "soft" sounding. In the extreme counterclockwise position, the keying time constant is minimum, and the emitted wave will be sharp or "hard" sounding. The correct operating position of the keying waveshape control will be somewhere between these extremes and can be adjusted to suit the operator. The shaping adjustment will be the same whether the exciter is connected directly to an antenna or through a linear amplifier. However, if a class C power amplifier is used, the shaping will have to be adjusted for a softer characteristic, because the class C power amplifier will sharpen the waveshape. Undesirable key clicks may result if the 32S-3 is operated with the keying waveshape control in the extreme counterclockwise position.

2.1.4 FREQUENCY SPOTTING.

NOTE

The 32S-3 must be tuned up for proper CW operation if the CW CAL function is to perform effectively.

If the 32S-3 is connected with a 75S-() Receiver, as shown in figure 1-2, and it is desired to zero beat the 32S-3 to a frequency tuned on the receiver, set CW CAL knob to 3 o'clock, and gently push in on the shaft in the center of the CW CAL knob (13) while rocking the tuning dial across the receiver frequency. A signal will be heard as the 32S-3 CW CAL signal passes across the receiver frequency. Zero beat this signal by manipulating the 32S-3 tuning dial. The level of the CW CAL signal is adjustable with the CW CAL knob. Maximum output is obtained with the control rotated fully clockwise.

2.1.5 SIDETONE OUTPUT ADJUSTMENT.

The tone oscillator output is fed to SIDETONE jack J19 when the key is closed. The SIDETONE ADJUST is a screwdriver control located under the top cover on a standoff bracket to the right of the vfo. With the 75S-() and 32S-3 connected as shown in figure 1-2, and the 75S-() audio gain control set in the desired position for CW operation, key the 32S-3, and adjust the SIDETONE ADJUST control for the desired level at the receiver audio output.

CAUTION

If the 32S-3 is to be operated in keydown continuous exciter service, limit plate load-
ing to 200 ma.

2.1.6 OPERATION WITH 62S-1 VHF CONVERTER, 30S-1, AND 30L-1 LINEAR AMPLIFIERS.

If the antenna into which the 32S-3 is initially loaded is reactive (less than 2:1 swr) and does not represent a 50-ohm resistive load to the transmitter, slight retouching of the P.A. TUNING may be necessary when operation with a linear amplifier is begun.

Keying characteristics may be somewhat modified due to amplifier characteristics. The keying waveshape control setting can be changed to obtain the desired transmitted signal. The keying characteristics are also somewhat dependent upon drive level to the amplifier. To obtain the proper drive level, place the METER switch in the ALC position. While sending a series of dots adjust the MIC GAIN control for a 4- to 5-db reading on the meter. Be sure that the 32S-3 ALC jack, J15, is patched to the ALC jack on the 62S-1, 30S-1, or 30L-1, whichever unit is being used.

2.2 SSB Tuning Procedure.

2.2.1 TUNEUP.

a. Perform steps a through g in paragraph 2.1.1. Plug a high-impedance microphone into MIC jack J1 (8).

b. Set EMISSION switch to the desired sideband (USB or LSB).

c. Set METER switch to ALC.

d. Actuate the PTT line in one of the following ways: Close the PTT switch on the microphone, short PTT jack J4, rotate VOX GAIN control under the top cover fully counterclockwise to the PTT position, or (if using a 312B-4 station control) place the 312B-4 FUNCTION switch to the TRANSMIT ONLY position.

e. While talking into the microphone, advance the MIC GAIN control until the meter indicates about 6 db average (lower scale). Peaks may be much higher.

f. Release the PTT switch.

TABLE 2-1. 32S-3 CONTROL FUNCTIONS

CONTROL	FUNCTION
FREQ CONTROL (S9)	
OFF	Opens connection between pins 5 and 7 in power connector J10 to remove ac power from power supply.
REC VFO	Connects 75S-() receiver vfo to 32S-3 for transceive operation, and disconnects transmitter vfo.
TRANS VFO	Connects 32S-3 internal vfo to first mixer, and supplies B+ to vfo tube V301.
SYNC.	Removes screen voltage from PA tubes to provide weak signal for zero beat adjustment.
CW CAL (S13, R31)	Pushing in supplies B+ to exciter stages to provide CW signal for zero beat adjustment. Turning varies level of calibrate signal.
MIC GAIN (R8A, B)	Controls audio amplifier gain for SSB operation, and controls carrier level for CW operation and tuning.
EXCITER TUNING	Controls all ganged slug-tuned circuits in exciter portion of transmitter.
BAND (S1 thru S6, S11)	Selects capacitors and crystals needed to tune transmitter to desired 200-kc band.
PA TUNING (C77)	Resonates PA plate circuit to operating frequency.
INCREASING LOADING (C147)	Adjusts transmitter output circuit to match transmission line impedance for maximum power transfer.
EMISSION (S8)	
TUNE	Reduces PA screen voltage with series resistor, and produces CW carrier for tuneup.
LOCK KEY	Grounds key line for continuous output in CW mode at full power. Used for tuning.
LSB	Selects LSB bfo crystal for LSB operation.
USB	Selects USB bfo crystal, and lowers vfo frequency for USB operation.
CW	Selects USB bfo crystal, raises vfo frequency, and applies bfo signal directly to first mixer, bypassing balanced modulator and mechanical filter.
METER (S7)	
ALC	Shows alc action by measuring cathode voltage changes at if. amplifier V3.
P.A. GRID	Measures PA grid current

SECTION 2
Operation

TABLE 2-1. 32S-3 CONTROL FUNCTIONS (Cont)

CONTROL	FUNCTION
P.A. PLATE	Measures PA plate current by measuring PA cathode voltage changes.
*ANTI VOX GAIN (R85)	Controls gain of antivox amplifier to prevent speaker noises from tripping microphone vox circuit.
*VOX GAIN (R74)	Controls gain of vox amplifier for voice-controlled operation.
*VOX TIME CONSTANT (R86)	Controls hold-in time of vox circuit.
* These controls are inside the cabinet.	

2.2.2 VOX OPERATION.

a. Talk steadily into the microphone, and advance the VOX GAIN control (under top cover) until the vox relay operates. If the vox circuits transfer between words, increase the hold time by turning the VOX TIME CONST control (under the top cover) clockwise. If the relays momentarily drop out during speech, increase the setting of the VOX GAIN control. If the vox relays do not drop out as fast as desired, turn VOX TIME CONST control (under the top cover) counterclockwise until they do.

b. To adjust antivox, set receiver af gain for normal audio level with receiver tuned to signal. If loudspeaker output causes transmitter vox circuits to operate, advance the ANTI VOX GAIN control (under top cover) in clockwise direction, and set to a level just above the point at which the receiver loudspeaker output no longer keys the transmitter vox circuits into operation. It may be necessary to increase vox gain slightly after the antivox gain is set, depending on the separation between microphone and loudspeaker.

2.2.3 SSB ZERO BEAT.

a. Transmitter and receiver must be connected as shown in figure 1-2.

b. Place transmitter FREQ CONTROL switch in SYNC. position. Set both transmitter and receiver to the same sideband.

c. Slowly tune the transmitter vfo until the beat note sounds like a canary chirping. When the frequency of chirps is two or three per second, the transmitter is zero beat with the receiver within two or three cycles per second. This is a fine tuning adjustment and must be done slowly and carefully. If the microphone in use is very sensitive and omnidirectional, turn down the receiver af gain control to eliminate the extraneous beat notes which may appear near the zero frequency. The desired chirp will be higher pitched. When the transmitter is tuned to the exact frequency of the receiver, the two frequencies are at zero phase difference, and there will be no chirps.

d. Set zero set knob (3) on the 32S-3 so that hairline indicates same frequency as that of receiver.

e. Switch the transmitter FREQ CONTROL to TRANS VFO. The transmitter and receiver are now set for operation on the same frequency.

NOTE

The CW CAL function works only on CW and will not work on sideband.

2.2.4 OPERATION WITH LINEAR AMPLIFIER OTHER THAN 30S-1 OR 30L-1.

a. Perform paragraph 1.3, but set bias to produce 50-ma no-signal plate current.

b. Load for a plate current of 200 ma when performing tuneup.

c. If linear amplifier requires less than 80-100 watts pep drive, use a power attenuator to reduce output level to that required by the linear amplifier.

d. Refer to paragraph 2.1.6.

2.2.5 A.F.S.K. OPERATION.

If audio frequency shift keying is used, the audio input level must not exceed 80 millivolts, and external cooling must be provided for the power amplifier tubes.

2.3 Operation as Transceiver with 75S-() Receiver.

a. Connect the 32S-3 and 75S-() as shown in figure 1-2 or 1-3.

b. Remove cable from XMTR XTAL OSC jack J7 (front of slug rack), and plug it into RCVR XTAL OSC jack J6 (center of slug rack). Remove the 100-ohm dummy load plug from the 75S-() XTAL OSC OUTPUT jack, and plug it into 32S-3 XMTR XTAL OSC jack J7.

c. Set FREQ CONTROL on 32S-3 to REC VFO position.

d. Set OFF-STBY-OPR-CAL switch on 75S-() to STBY position.

e. Set both BAND selectors to the same desired band and both EMISSION switches to the same position (either USB, LSB or CW).

f. Tune both receiver and transmitter as in normal operation. Both transmit and receive functions operate from the receiver vfo, and the transmitter vfo is not used. Switching the transmitter FREQ CONTROL back to TRANS VFO position will allow separate operation of the two units within the same 200-kc band.

CAUTION

When operating in transceiver service, do not operate the transmitter while the receiver is tuned outside band limits; the transmitted signal will be out of the band. Do not attempt operation with receiver and transmitter set on different 200-kc bands, even when operating in TRANS VFO position. With patch cables connected for transceiver operation, the receiver hf crystal oscillator controls injection frequency to the transmitter second mixer.

If operation on different 200-kc bands is desired, remove the transceiver patch cables. Use reverse of procedure outlined in paragraphs a and b.

If transmitted frequency is changed by any great amount, be sure to redip the PA plate current and check the loading. This will be most important on the 80 and 40 meter bands. Refer to table 2-2 for the amount of frequency change possible without retuning on each band.

Do not attempt operation in transceiver service with any other receiver not having the same frequency mixing scheme.

TABLE 2-2. APPROXIMATE FREQUENCY CHANGE BEFORE TRANSMITTER RETUNING IS REQUIRED

BANDS (mc)				
3.4-4	7-7.4	14-14.4	21-21.6	28-30
15 kc	30 kc	50 kc	75 kc	100 kc

g. To restore both units to normal operation, remove the two patch cables connecting oscillator signals, reconnect cable to J7 on the transmitter slug rack (under top cover), and replace the 100-ohm load plug in the receiver XTAL OSC OUTPUT jack.

2.4 Operation Outside Amateur Bands.

All amateur bands are completely covered except the 10-meter band for which one crystal is furnished

(for 28.5 to 28.7 mc). Two extra sockets are provided for additional crystals in this band.

The transmitter can be operated at other frequencies outside the specified amateur bands (MARS frequencies) or at other 10-meter frequencies by plugging the proper crystals into the mounting board. Figure 2-2 shows calibration curves, and figure 2-3 shows crystal socket locations. Select these crystals as follows.

CAUTION

Avoid operation between 5.0 mc and 6.5 mc. In this range, the second harmonic of the variable if. frequency is close to the operating frequency. Some of this energy will pass through the tuned circuits and become spurious emission.

a. If the lower edge of the desired 200-kc band is less than 11.800 mc, the required crystal frequency is equal to the lower edge of the desired band plus 3.155 mc. As an example, if the desired band is 4.0 to 4.2 mc, 4.0 mc plus 3.155 mc equals 7.155 mc.

b. If the lower edge of the desired 200-kc band is 12.000 mc or higher, the required crystal frequency is half the sum of the lower desired band edge plus 3.155 mc. As an example, if the desired band is 14.4 mc to 14.6 mc,

$$\frac{14.4 + 3.155}{2} = 8.7775 \text{ mc}$$

The plate circuit of the oscillator is tuned to twice the crystal frequency when operating above 12 mc.

c. Substitute or extra crystals should be plugged into the appropriate socket on the mounting board according to the best location in one of the five bands. By referring to the exciter tune calibration curves in figure 2-2, select the band letter corresponding to the desired operating frequency, and place the required crystal in a crystal socket bearing the same band letter. If additional 10-meter crystals are used, they should be plugged into the sockets marked E. Table 2-3 lists crystal socket designations, switch positions (BAND), crystal frequencies furnished, and frequency range limitations. For extra coverage crystals available, see section 6, Parts List.

2.5 Operation with 75A-4.

Mute 75A-4 by connecting REC MUTE on 32S-3 to pins 1 and 2 on E-3 terminal board on rear of 75A-4 (connect braid to pin 1 and center wire to pin 2). Operate with 75A-4 in standby condition. Feed 75A-4 500-ohm audio to ANTI-VOX input on 32S-3. Calibrate or zero beat using SYNC. position of FREQ CONTROL switch same as with 75S-() receivers.

2.6 Operation with 75A-4 and 312B-4.

Connect and operate same as paragraph 2.5, except feed 500-ohm audio from 75A-4 to ANTI-VOX jack on 312B-4. Also feed 4-ohm audio to 312B-4.

SECTION 2
Operation

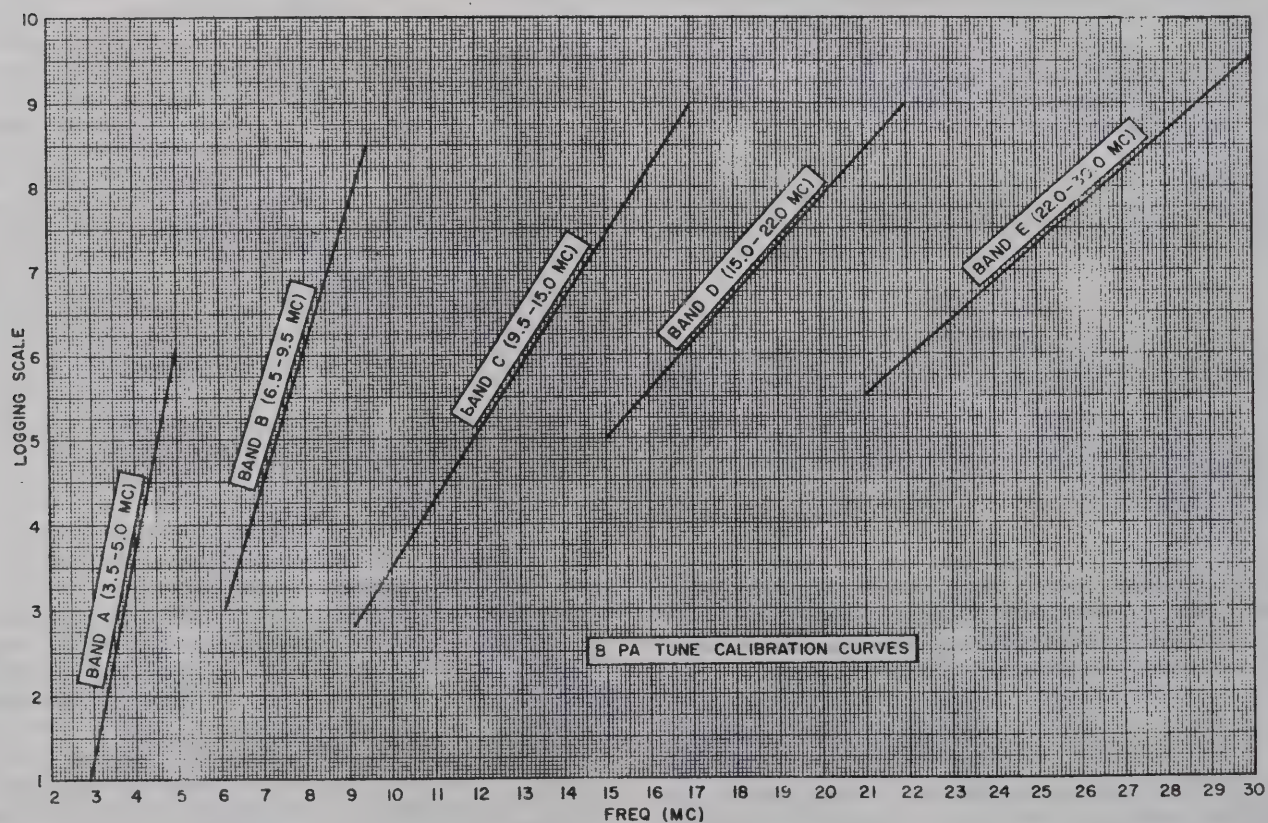
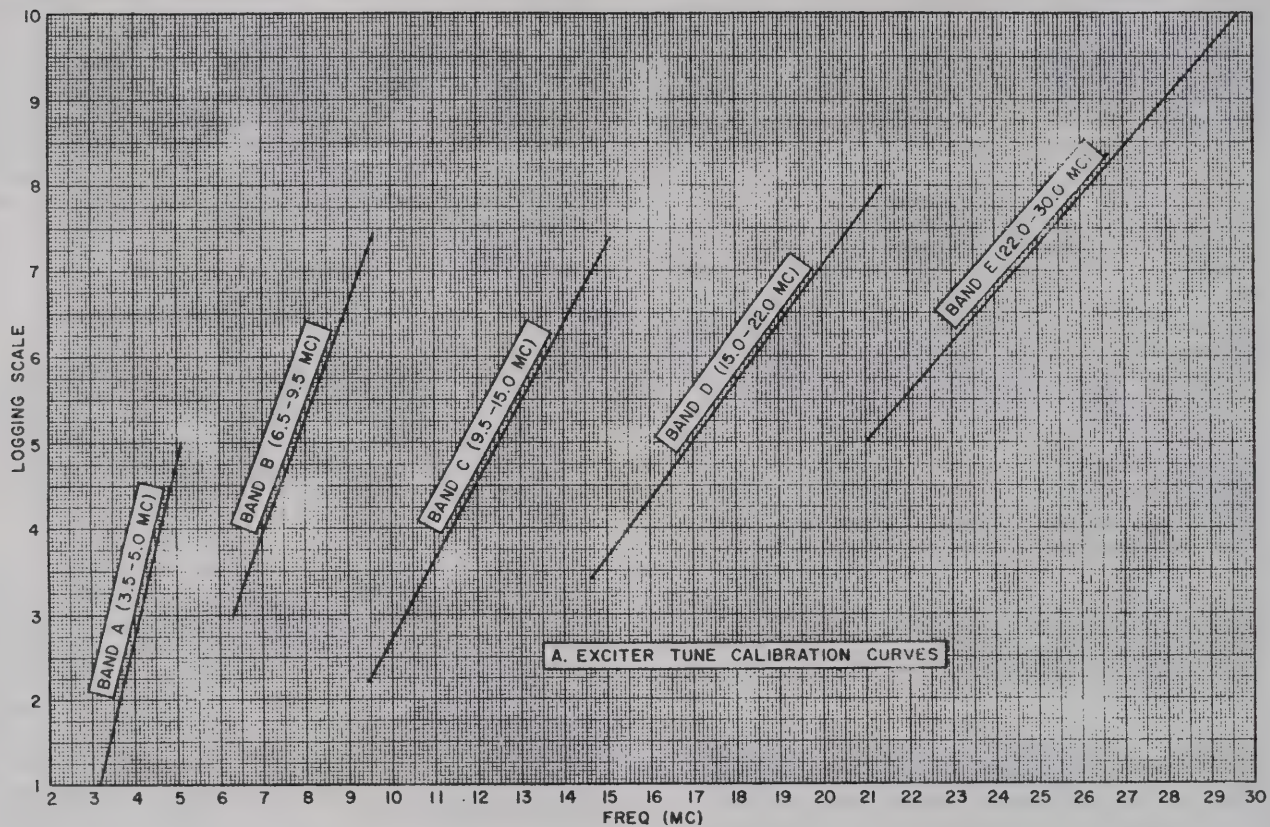


Figure 2-2. Calibration Curves

TABLE 2-3. CRYSTAL FREQUENCIES AND OPERATING BANDS

BAND SWITCH POSITION	FREQUENCY BAND	CRYSTAL SUPPLIED	CRYSTAL SOCKET CONNECTED	TOTAL COVERAGE
1A - 3.4 2A - 3.6 3A - 3.8	3.4 - 3.6 mc 3.6 - 3.8 mc 3.8 - 4.0 mc	6.555 mc 6.755 mc 6.955 mc	1A 2A 3A	A 3.4 - 5.0 mc
1B - 7.0 2B - 7.2	7.0 - 7.2 mc 7.2 - 7.4 mc	10.155 mc 10.355 mc	1B 2B	B 6.5 - 9.5 mc
1C - 14.0 2C - 14.2 3C - 14.8	14.0 - 14.2 mc 14.2 - 14.4 mc 14.8 - 15.0 mc	8.5775 mc 8.6775 mc 8.9775 mc	1C 2C 3C	C 9.5 - 15.0 mc
1D - 21.0 2D - 21.2 3D - 21.4	21.0 - 21.2 mc 21.2 - 21.4 mc 21.4 - 21.6 mc	12.0775 mc 12.1775 mc 12.2775 mc	1D 2D 3D	D 15.0 - 22.0 mc
1E - 28A 2E - 28B 3E - 28C	28.5 - 28.7 mc As selected As selected	15.8275 mc Not furnished Not furnished	1E 2E 3E	E 22.0 - 30.0 mc

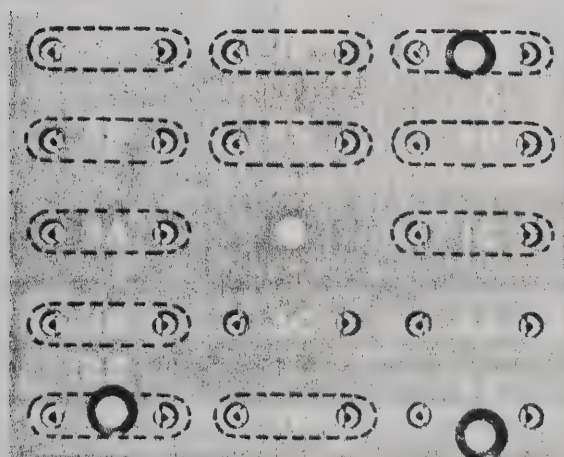


Figure 2-3. Crystal Socket Locations

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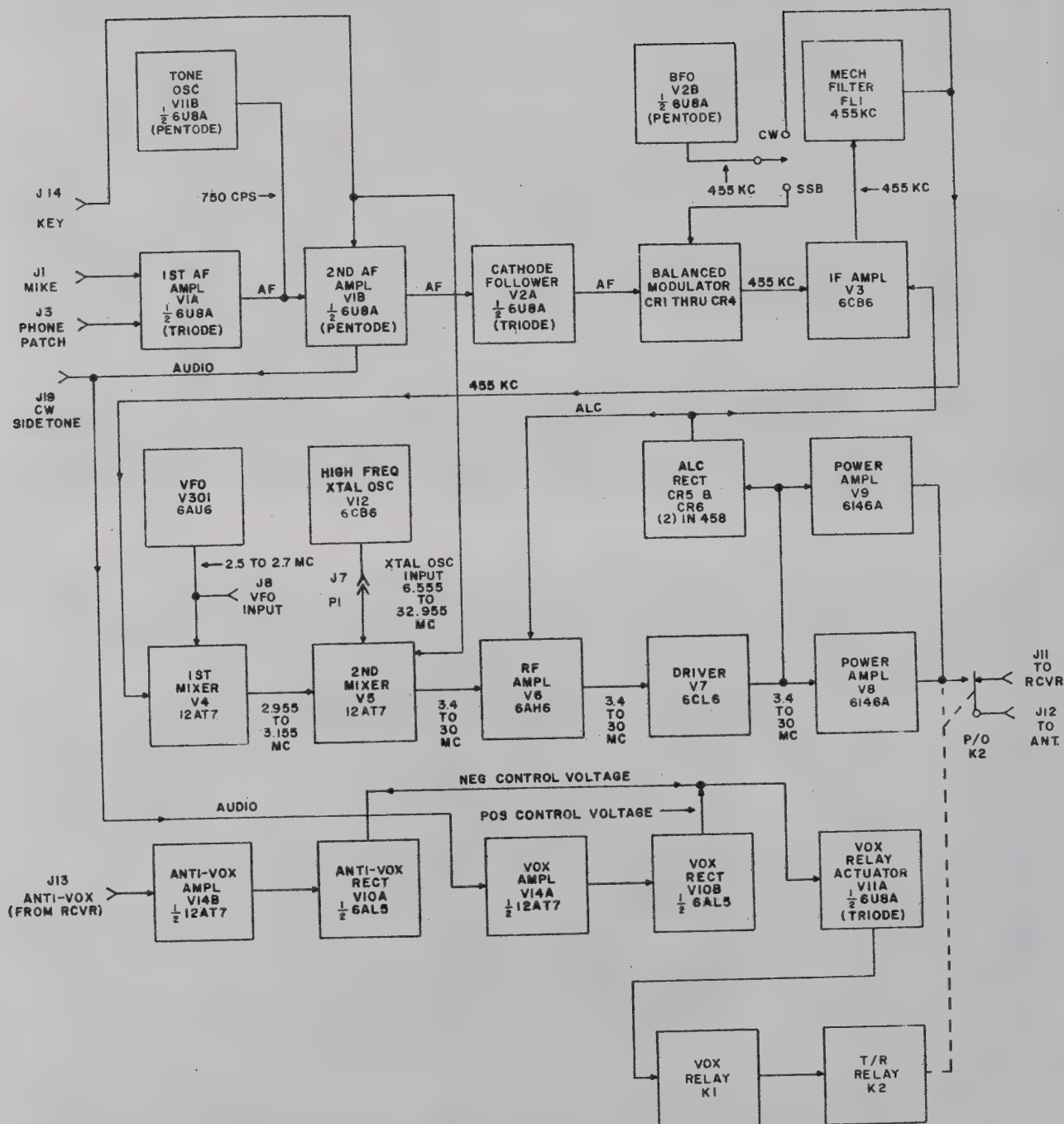


Figure 3-1. Block Diagram

principles of operation

3.1 Block Diagram.

Refer to figure 3-1. Type 32S-3 is a 175-watt input amateur transmitter covering the 80-, 40-, 20-, 15- and 10-meter bands. The transmitter uses filter type sideband generation and heterodyne exciter principles. A crystal-controlled bfo, crystal-controlled high-frequency oscillator, and highly stable vfo form a double conversion circuit. The low-frequency if. is 455 kc, and the high-frequency if. is 3.055 mc with a 200-kc wide passband, from 2.955 to 3.155 mc. The 32S-3 may be connected in transceiver service with 75S-() receivers. Figure 7-1 is a schematic diagram of the 32S-3.

3.2 AF Circuits.

Microphone or phone patch audio is coupled to the grid of first audio amplifier V1A, amplified, and coupled to the grid of second audio amplifier V1B. Output from V1B is coupled to the grid of cathode follower V2A across MIC GAIN control. Output from the cathode follower is fed to the balanced modulator. In TUNE, LOCK KEY, and CW positions of the EMISSION switch, output from the tone oscillator, V11B, is fed to the grid of the second audio amplifier. Tone-oscillator signal is taken from the plate of V1B to the grid of the vox amplifier and the CW sidetone jack, J19.

3.3 Balanced Modulator and Associated Circuits.

Audio output from the cathode of V2A is fed to the junction of CR3 and CR4. In USB and LSB positions of the EMISSION switch, the bfo voltage is fed to the junction of C187A and C187B. (In TUNE, LOCK KEY, and CW positions of the EMISSION switch, the bfo voltage bypasses the balanced modulator, if. amplifier, and mechanical filter and is fed directly to one of the first mixer cathodes.) Output from the balanced modulator consists of both upper and lower sidebands and is coupled through if. transformer T2 to the grid of if. amplifier V3. Output from if. amplifier V3 is fed to mechanical filter FL1. The passband of FL1 is centered at 455 kilocycles.

This passes either upper or lower sideband depending upon the sideband polarity selected when the EMISSION switch connects bfo crystal Y12 or Y13.

3.4 Balanced Mixers.

The 455-kc single-sideband signal is fed to the first balanced mixer grids in push-pull; the plates are

connected in push-pull; and the vfo signal is fed to the grids in parallel. The mixer suppresses the vfo signal and translates the 455-kc single-sideband signal to a frequency between 2.955 and 3.155 mc. This is the bandpass if. The coupling network between the plates of the first mixer and the grid of the second balanced mixer is broadbanded to provide a uniform response to the bandpass if. The bandpass if. signal is fed to one of the grids of the second balanced mixer, and the high-frequency injection signal from the crystal oscillator V12 is fed to the signal input cathode and to the other grid. This arrangement suppresses the high-frequency injection signal within the mixer and translates the bandpass if. signal to the desired operating band.

3.5 RF Circuits.

The slug-tuned circuits coupling V5 to V6, V6 to V7, and V7 to the power amplifier are ganged to the EXCITER TUNING control. The signal is amplified by rf amplifier V6 and driver V7 to drive power amplifier V8 and V9. Output from the power amplifier is coupled by a pi-network to the antenna through contacts of transmit-receive relay K2. Negative rf feedback from the PA plate circuit to the driver cathode circuit permits a high degree of linearity at the high power level of the PA tubes. Both the driver and PA stages are neutralized to ensure their stability.

3.6 Control Circuits.

3.6.1 ALC CIRCUIT.

Detected audio-frequency voltage from the power amplifier grid circuit is rectified by CR5 and CR6, and the negative dc output is fed to the alc bus. A fast attack, slow release, dual time constant is used to prevent over-driving on initial syllables and to hold gain constant between words. The fast time constant alc is applied to V6, and the slow time constant alc is applied to V3. If the companion 30S-1 or 30L-1 Power Amplifier is used with the 32S-3, alc output from the 30S-1 or 30L-1 is fed back to the alc bus.

3.6.2 VOX AND ANTIVOX CIRCUITS.

Output from second audio amplifier V1B is fed to the grid of vox amplifier V14A through VOX GAIN control R74. This audio input is amplified by V14A and rectified by vox rectifier V10B. When the positive

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output of V10B is high enough to overcome the negative bias on V11A grid, the vox relay is actuated to turn the transmitter on. Receiver output is fed from J13 through ANTI VOX GAIN control, R85 to the grid of antivox amplifier V14B. Output from V14B is rectified by antivox rectifier V10A to provide the negative bias necessary to keep the transmitter disabled during receive periods. The antivox circuit provides a threshold voltage to prevent loudspeaker output (picked up by the microphone) from tripping the vox circuit into transmit. ANTI VOX GAIN control R85 adjusts the value of the antivox threshold so that loudspeaker output will not produce enough positive dc output from the vox rectifier to exceed the negative dc output from the antivox rectifier and cause V11A to actuate vox relay K1. Speech energy into the microphone will cause the positive vox voltage to overcome the negative antivox voltage and produce the desired action of K1. Contacts of relay K1 control relay K2, key line, PA and driver screens, receiver muting circuits, and oscillator plate voltages.

3.6.3 MANUAL GAIN CONTROL.

The MIC GAIN control is a dual potentiometer. Section R8A controls microphone gain during SSB operation. Section R8B is a cathode potentiometer which controls the gain of rf amplifier V6 during CW, TUNE, or LOCK-KEY operation. This control will be set more clockwise in these modes than it will be in the USB or LSB modes.

3.7 Oscillators.

3.7.1 TONE OSCILLATOR.

The tone oscillator is used for vox circuit actuation and sidetone generation during CW operation. It consists of an RC phase-shift oscillator operating at approximately 750 cps. Its output is amplified by the second audio amplifier which then supplies the sidetone output and also activates the vox circuitry to provide CW break-in. In TUNE and LOCK KEY, the oscillator is used in conjunction with the second audio amplifier to give sidetone output. The oscillator is turned on when EMISSION switch section S8C is in TUNE, LOCK KEY, or CW position.

3.7.2 BEAT-FREQUENCY OSCILLATOR.

The bfo is crystal controlled at either 453.650 kc or 456.350 kc, depending upon whether Y12 or Y13 is selected by EMISSION switch section S8F. These crystal frequencies are on either side of the passband of mechanical filter FL1, so the carrier frequency is placed approximately 20 db down on the skirts of the filter response. This carrier suppression is in addition to the 30-db minimum suppression provided by the balanced modulator.

3.7.3 VARIABLE-FREQUENCY OSCILLATOR.

The vfo uses fixed capacitors, a permeability tuned variable inductor, and fixed inductors to provide the tuning range of 2.5 to 2.7 mc. The frequency-determining network is composed of capacitors C301, C302, C303, and C305, and inductors L301, L302, and L303. Capacitor C303 is paralleled by trimmer capacitor C308 and diode CR301 connected in series. A dc bias voltage is applied to the diode through rf isolation resistor R303. When LSB emission is selected, negative bias is applied to CR301 which switches C308 out of the circuit. Selection of USB emission applies positive bias to CR301, causing it to conduct which switches C308 into the circuit. Proper adjustment of C308 shifts the vfo output frequency by an amount equal to the frequency separation of the two bfo crystals. This allows selection of either sideband without changing the suppressed-carrier frequency of the exciter rf output.

3.7.4 HIGH-FREQUENCY CRYSTAL OSCILLATOR.

High-frequency crystal oscillator V12 is crystal controlled by one of 11 supplied crystals selected by BAND switch S11. Three additional blank sockets are provided in the crystal socket board. Output from the high-frequency crystal oscillator is fed to the second mixer. This frequency is always 3.155 mc higher than the lower edge of the desired transmit band. This high-frequency injection signal is the crystal fundamental frequency for all desired output signals below 12 megacycles, but for operating frequencies higher than 12 megacycles, the crystal frequency is doubled in the plate circuit of the oscillator.

3.8 Keying Circuits.

Grid-block type keying is used for CW operation in the 32S-3. With the key up, a negative voltage is applied to the grids of the second audio amplifier and the second mixer. This prevents the amplified tone oscillator output from actuating the vox circuitry and also cuts off the second mixer. The keying time constant of the second audio amplifier is fast attack and slow release with R127 and C115 determining the fast attack and R125 and C115 determining the slow release. The keying time constant of the second mixer is slow attack and slow release with the slow attack determined by R123, R124, and C81. R123, R124, C81, and C115 determine slow-release time. When keying takes place, second audio amplifier and the vox circuitry are actuated before the second mixer. The release times of the second audio amplifier and second mixer are approximately the same. The VOX TIME CONSTANT control adjusts release time of the vox circuitry to permit fast ON-OFF keying.

Variable resistor R123 provides a choice between the extremes of "hard" and "soft" keying. This control and its effect is described fully in paragraph 2.1.3. Capacitor C115 determines, to a large extent, the release time of the "break." An additional effect is that the larger this capacitor, the greater is the

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"lag" introduced which is characterized by the bell-like type of keying well known to CW operators. The value of C115 and R123 have been chosen to produce generally acceptable keying. While it is not suggested the value of C115 should be changed, if the operator desires an increased amount of the bell-like characteristic, a slightly larger value will produce the effect. The additional "lag," however, will reduce the maximum speed at which the 32S-3 may be satisfactorily keyed.

An additional amplifier following an exciter can change keying characteristics. A well-designed and adjusted linear amplifier, such as the 30L-1 or 30S-1, has a negligible effect on keying. A class C amplifier and its associated power supply, however, will generally have considerable effect, because cutoff bias must be overcome before the signal is amplified, thus causing a sharp wavefront. Proper adjustment of the keying waveshape can only be made with the exciter driving the class C amplifier.

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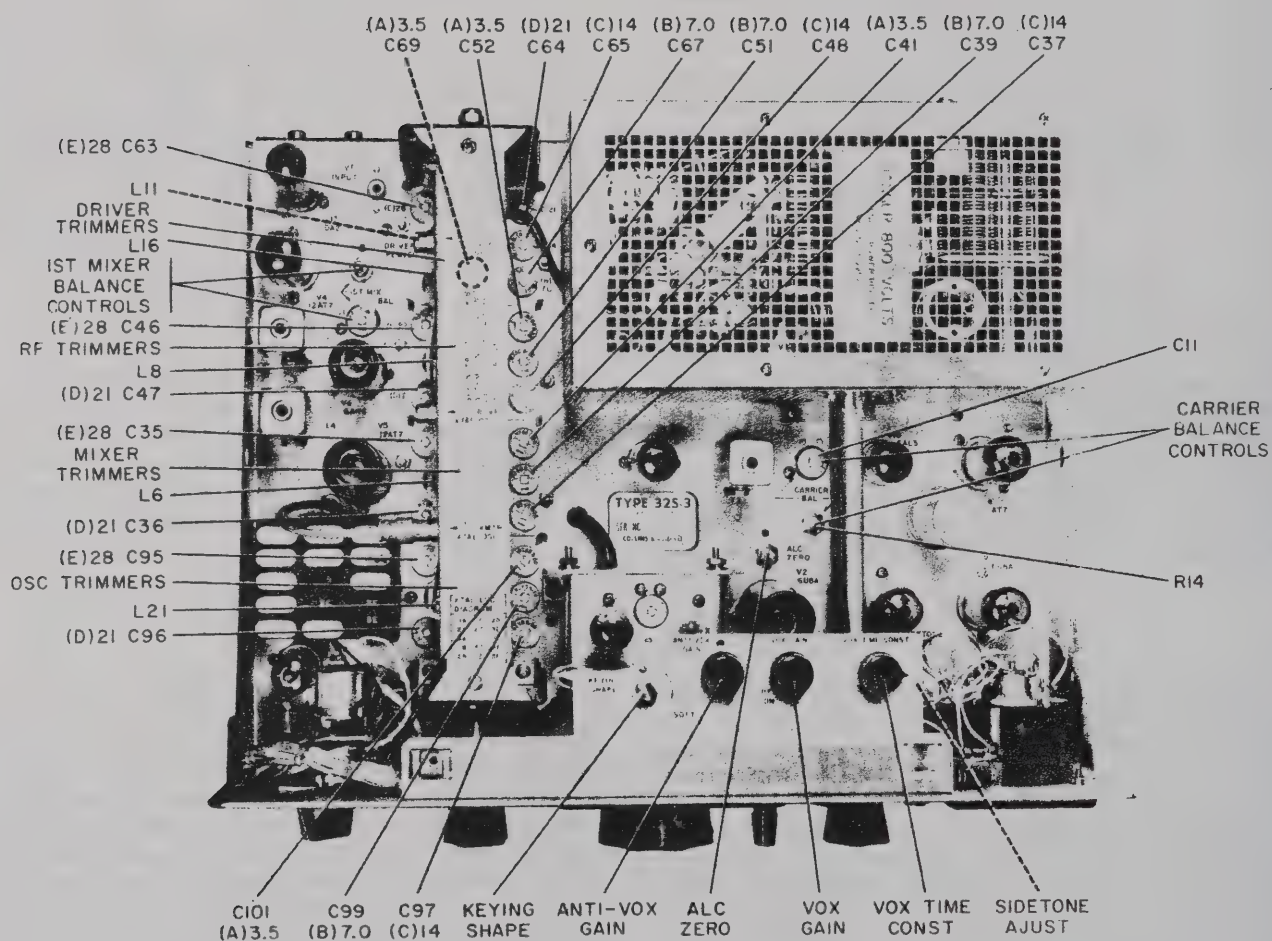


Figure 4-1. Location of Adjustments

service instructions

4.1 General.

This section provides maintenance and service information for the 32S-3 Transmitter. It covers trouble analysis, signal tracing procedures, voltage and resistance measurements, and alignment procedures. Except for an occasional touchup to compensate for possible component aging, alignment normally will be necessary only if frequency-determining components have been replaced. Component replacement repairs should be performed only by an experienced technician.

If servicing requires that the cabinet be removed, proceed as follows:

- a. Disconnect all power and external connections.
- b. Lift the lid, and remove the two screws located at the front edge of the cabinet.
- c. Remove the four feet and the screw located midway between the rear feet.
- d. From the rear, push the transmitter chassis forward until the front panel protrudes from the cabinet about an inch.
- e. Grasp the front panel at the edges, and slide the transmitter out of the cabinet.

NOTE

Do not lubricate the 70K-2 vfo shaft bearings or the dial drive system bearings. The vfo shaft bearing is lubricated at the factory with a special grease. Dial bearings are the Oilite type which are self-lubricating.

Tube filaments and pilot lamps are connected in parallel for 6-volt operation, and in series-parallel arrangements for 12- or 24-volt operation. When making tube or lamp replacements, be sure that rated filament currents are the same as the original units.

4.2 Trouble Analysis.

Most cases of trouble can be traced to defective tubes. Tube checkers cannot duplicate the conditions under which the tubes operate in the transmitter. Substitution of new tubes will sometimes clear an obscure case of trouble. Intermittent trouble conditions in tubes can usually be discovered by lightly tapping the envelope. Occasionally, tube pins or socket terminals will become dirty or corroded causing an intermittent condition. When this situation is suspected, remove the tube, and apply a few drops

of contact cleaner to the tube pins. Replace the tube, and work it up and down in the socket a few times. Shorted tubes or capacitors will often cause associated resistors to overheat and crack, blister, or discolor. Making the measurements listed in table 4-2 will help to isolate this type of trouble to a particular stage or component.

A logical process of elimination, in conjunction with a study of the main schematic diagram, block diagram, and section 3, will aid in isolating trouble. For example, if the transmitter functions properly in the TUNE, LOCK KEY, and CW positions but fails to operate in LSB or USB positions, trouble in the first audio amplifier, cathode follower, balanced modulator, or if amplifier should be suspected because this circuitry is not used for TUNE, LOCK KEY, or CW.

If the transmitter is to be returned to the factory or an authorized service agency, a detailed report of operational difficulties and repair efforts so far will assist the servicing agency in making repairs with a minimum of time and expense. This is particularly important when intermittent trouble is involved.

4.3 Signal Tracing.

Table 4-1 lists significant test points and normal signal levels. Figure 4-1 shows location of adjustments. Before making measurements, set EMISSION switch to USB, and disable the power amplifier by disconnecting screen and plate voltages from both tubes. Set the METER switch to P.A. GRID. Peak EXCITER TUNING, and turn VOX GAIN control counterclockwise until switch clicks. Connect signal generator output to test points indicated in table 4-1, and adjust signal generator output attenuator until PA grid current just begins to show on meter. Attenuator reading is signal voltage necessary at that point. Voltages given in the table are nominal and may vary plus or minus 20 percent. Be careful each time to set signal generator to frequency shown in table. Oscillator output voltage may be measured with a vacuum-tube voltmeter.

4.4 Voltage and Resistance Measurements.

Table 4-2 lists voltage and resistance measurements on all tube sockets. Do not open the oscillator can. Voltages and resistances given in the table are nominal and may vary plus or minus 20 percent. Measurements were taken under the following conditions:

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TABLE 4-1. SIGNAL LEVELS

TEST POINT	BAND-SWITCH POSITION	SIGNAL GENERATOR FREQUENCY	SIGNAL VOLTAGE AT TEST POINT
V7-2 (grid) or V6-5 (plate)	3.6 7.0 14.0 21.2 28A	3.7 mc 7.1 mc 14.1 mc 21.3 mc 28.6 mc	2.0 volts 1.3 volts 1.0 volt 1.4 volts 1.4 volts
V6-1 (grid)	3.6 7.0 14.0 21.2 28A 28B, 28C	3.7 mc 7.1 mc 14.1 mc 21.3 mc 28.6 mc According to crystal used	110 millivolts 90 millivolts 90 millivolts 85 millivolts 100 millivolts
V5-2 (grid)	14.0	3.055 mc	40 millivolts
V4-2 (grid)	14.0	3.055 mc	30 millivolts
V3-5 (plate)	14.0	455 kc	140 millivolts
V3-1	14.0	455 kc	4 millivolts

For following, disconnect signal generator, set EMISSION switch to TUNE, and adjust MIC GAIN for grid current threshold. Also short pin 2 of V2 to ground to prevent bfo leakage voltage from giving erroneous readings. Measure with vtvm.

V2A-8 (cathode)	Any	750 cps	8 millivolts
V2A-9 (grid)	Any	750 cps	11 millivolts
V1B-2 (grid)	Any	750 cps	0.35 volt

For following, turn EMISSION switch to USB, and connect audio oscillator to J3. Adjust audio oscillator output for PA grid current threshold, and measure voltage at test point with vtvm. Do not change MIC GAIN setting.

V1A-9 (grid) or J3 PHONE PATCH	Any	750 cps	35 millivolts
For following, measure at test point with vtvm and r-f probe.			
V5-3	3.6 7.0 14.0 21.2 28A		Voltages of 1.0 volt or more are sufficient for all five positions of the band switch.
V4-2 or 7	Vfo set at 100		1.5 volts
R119 arm	Any		1.5 volts

a. EMISSION switch in LSB or USB except where noted. FREQ CONTROL switch in TRANS VFO position for voltage measurements and in OFF position for resistance measurements. MIC GAIN is at minimum setting.

b. All measurements with vtvm and with all tubes in sockets.

c. Voltage measurements made with the tube under test operating normally, vox switch S10 closed, no power output.

d. Resistance measurements made with power supply plug removed from J10 and all other external connections removed.

e. All measurements made from socket pin to ground.

NOTE

When tube filaments and pilot lamps are connected in series-parallel arrangements for

12- or 24-volt operation, the associated voltages listed in the table will vary accordingly.

WARNING

Do not attempt any measurements of resistance without first disconnecting power to the transmitter.

Do not attempt the measurements of power amplifier plate voltage without special high-voltage test probe. The voltage is 800 volts dc. Do not make any other voltage or resistance measurements on 32S-3 with high voltage applied. Remove 5R4GYA rectifier from socket in 516F-2 power supply.

TABLE 4-2. VOLTAGE AND RESISTANCE MEASUREMENTS

TUBE		PIN NUMBER									PLATE CAP
		1	2	3	4	5	6	7	8	9	
V1	Dc v	90	0	70			110	1.5	1.7	0	
	Ac v				6.3						
	Ohms	75K	490K	62K	1.5	1.0	77K	470	680(1)	150K	
V2	Dc v	250	-9	125			210	0	5.8	0	
	Ac v				6.3	0					
	Ohms	40K	1 meg	190K	1.1	1.5	60K	0	1K	110K	
V3	Dc v	-0.85	+1.6			300	130	0			
	Ac v				6.3						
	Ohms	3.4 meg	220	0.4	0.9	34K	28K	0			
V4	Dc v	250	0	4.3			250		4.3		
	Ac v				6.3	6.3				0	
	Ohms	30K	56K	820	0.8	0.8	30K	56K	820	1.2	
V5	Dc v	250	-0.1	5.6			250	-0.6	5.2		
	Ac v				6.3	6.3				0	
	Ohms	30K	220K(8)	820	0.8	0.8	30K	220K(8)	820	1.2	
V6	Dc v	-1.0	0			250	160	+0.8			
	Ac v			6.3	0						
	Ohms	4.0 meg	0	0.8	1.2	30K	35K	180			
V7	Dc v	3.5	0	180			300	0	180	0	
	Ac v				0	6.3					
	Ohms	150	10K	54K	1.1	0.6	33K	0	54K	10K	
V8	Dc v	+0.1	0	+290	+0.1	-71	+0.1	0	0		800
	Ac v		6.3								
	Ohms	2.0	0.6	15K	2.0	50K	2.0	0	0		
V9	Dc v	+0.1	0	+290	+0.1	-71	+0.1	0	0		800
	Ac v		6.3					6.3			
	Ohms	2.0	0.6	15K	2.0	50K	2.0	0.6	0		

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TABLE 4-2. VOLTAGE AND RESISTANCE MEASUREMENTS (Cont)

		PIN NUMBER									
TUBE		1	2	3	4	5	6	7	8	9	PLATE CAP
V10	Dc v	+0.1	-0.1			+0.6	0	-0.8			
	Ac v			6.3	0						
	Ohms	100K	100K	1.5	1.0	∞	∞	∞			
V11	Dc v	210	0	300(6)			300(6)	50(7)	5.5	+0.1	
	Ac v				6.3	0					
	Ohms	41K	220K	150K	1.5	1.1	68K	1K(4)	370(5)	∞	
V12	Dc v	-5.0 to -8.2(3)	0.1 to 0.4(3)			150	150	0			
	Ac v			6.3	0						
	Ohms	100K	100	1.5	2.0	32K	32K	0			
V13	Dc v	150	0			150		0			
	Ac v				0						
	Ohms	32K	0		0	32K		0			
V14	Dc v	210	0	2.5			210	0	2.5	0	
	Ac v				0	0				6.3	
	Ohms	75K	1 meg	1K	1.1	1.1	75K	1 meg	1K	1.5	
V301	Dc v	-3.0				+150	+85	0			
	Ac v				6.3						
	Ohms	100K	0	0	0.7	15K	100K	0			
(1) LSB and USB, open on TUNE, LOCK KEY, and CW. (2) 33 ohms in CW. (3) Varies with band. (4) Open on USB and LSB. (5) 1500 ohms with S10 open. (6) 150 volts on TUNE, LOCK KEY, and CW. (7) 4 volts on TUNE, LOCK KEY, and CW. (8) Varies with KEYING SHAPE control setting.											

4.5 Field Alignment Procedures.

4.5.1 FIELD ALIGNMENT.

Field alignment consists of a few simple adjustments and is intended as a means of restoring peak performance of a working 32S-3. No alignment procedure should ever be performed just for the sake of alignment. Adjustments should be made only when there is reason to suspect that performance is not up to standard. The 32S-3 does not have to be removed from its cabinet for field alignment. All adjustment points can be reached by raising the cabinet lid.

4.5.2 TEST EQUIPMENT REQUIRED.

Test equipments required for field alignment of the 32S-3 are a 50-ohm, 100-watt dummy load, and a receiver with a 100-kc crystal calibrator and an S-meter.

4.5.3 RF CIRCUITS PEAKING.

a. Connect dummy load to 32S-3 output jack J12. Set 32S-3 controls as follows: FREQ CONTROL to TRANS VFO, BAND to 28A, EMISSION to LSB, MIC GAIN to OFF, INCREASE LOADING to 50 Ω , and tuning dial to 100.

b. After a 5-minute warmup period, set EMISSION switch to TUNE and METER switch to P.A. GRID. Adjust MIC GAIN and EXCITER TUNING to produce midscale indication on meter. Set METER switch to P.A. PLATE, and dip plate current with P.A. TUNING. Reset METER switch to P.A. GRID. Peak the four (E)28 trimmer capacitors (C95, C35, C46 and C63) for maximum grid current. See figure 4-1 for trimmer locations.

c. Set BAND switch to 21.2 and tuning dial to 100. Adjust MIC GAIN and EXCITER TUNING for midscale grid current. Set METER switch to P.A. PLATE, and dip plate current. Reset METER switch to P.A. GRID. Peak the four (D)21 trimmer capacitors (C96, C36, C47, and C64) for maximum grid current.

d. Set BAND switch to 14.0 and tuning dial to 150. Adjust MIC GAIN and EXCITER TUNING for midscale grid current. Set METER switch to P.A. PLATE, and dip plate current. Reset METER switch to P.A. GRID. Peak the four (C)14 trimmer capacitors (C97, C37, C48, and C65) for maximum grid current.

e. Set BAND switch to 7.0 and tuning dial to 150. Adjust MIC GAIN and EXCITER TUNING for midscale grid current. Set METER switch to P.A. PLATE, and dip plate current. Reset METER switch to P.A. GRID. Peak the four (B)7.0 trimmer capacitors C99, C39, C51, and C67 for maximum grid current.

- f. Set BAND switch to 3.6 and tuning dial to 100. Adjust MIC GAIN and EXCITER TUNING for midscale grid current. Set METER switch to P.A. PLATE, and dip plate current. Reset METER switch to P.A. GRID. Peak the four (A)3.5 trimmer capacitors C101, C41, C52, and C69) for maximum grid current.
- g. Set the EMISSION switch to LSB.

4.5.4 VFO SIDEBAND FREQUENCY SHIFT ADJUSTMENT.

CAUTION

Do not make this adjustment unless switching from one sideband to the other makes re-adjustment of tuning dial necessary to keep output signal from shifting.

- a. Set EMISSION switch to LSB, METER switch to P.A. PLATE, BAND switch to 14.0, and tuning dial to 100. Turn VOX GAIN (under top cover) full counterclockwise until switch clicks.
- b. Rotate CARRIER BAL potentiometer R14 to one end to allow carrier feedthrough.
- c. Adjust EXCITER TUNING control for maximum plate current, and dip the plate current with the P.A. TUNING control.
- d. Tune the station receiver to zero beat with the transmitter.
- e. Set EMISSION switch to USB, and adjust trimmer C308 (top of vfo can) for zero beat.

4.5.5 CARRIER BALANCE (NULL) ADJUSTMENT.

- a. Set BAND switch to 3.6 and tuning dial to 100.
- b. Set EMISSION switch to LSB, and turn MIC GAIN fully counterclockwise until it clicks. Key the 32S-3 by turning VOX GAIN counterclockwise until it clicks or by grounding push-to-talk (PTT) line at jack J4.
- c. Loosely couple receiver antenna lead to dummy load, and peak EXCITER TUNING and P.A. TUNING to obtain a midscale reading on receive S-meter.
- d. Adjust CARRIER BAL potentiometer R14 and trimmer capacitor C11 for minimum indication on the receiver S-meter. These adjustments interact, so adjust first one and then the other until neither produces any further decrease in S-meter indication.
- e. Switch EMISSION switch back and forth between USB and LSB to see that the carrier suppression is about the same for either sideband. If it is not, repeat step d until carrier suppression is about equal for both sidebands.
- f. Remove receiver antenna lead for near dummy load, and remove short from PTT line.

4.5.6 ALC ZERO ADJUSTMENT.

- a. Set EMISSION switch to TUNE position. Tune and load the transmitter to 14.1 mc. Set EMISSION switch to USB.

- b. Turn MIC GAIN control to minimum, and set METER switch to ALC position. Short PTT jack to ground.

- c. Adjust ALC ZERO potentiometer (top chassis near V2) until meter indicates zero. Remove PTT short.

4.5.7 FIRST MIXER BALANCE ADJUSTMENT.

- a. Set BAND switch to 21.0 and tuning dial to 0. Tune and load 32S-3 into dummy load, then set EMISSION switch to LSB and MIC GAIN to counterclockwise limit until switch clicks.

- b. Loosely couple receiver antenna lead to dummy load. Tune receiver across 21.455 mc until signal is heard.

- c. Adjust mixer balance potentiometer R27 and trimmer capacitor C26 for minimum signal. These adjustments interact, so adjust first one and then the other until neither produces any further decrease in output.

4.5.8 VFO DIAL CALIBRATION.

The calibration of the 32S-3 vfo must be checked against a receiver with a 100-kc crystal calibrator. With the BAND switch set to 3.6, the 32S-3 output should be in zero beat with the calibrator signal at 3600 kc (0 on the 32S-3 dial) and 3800 kc (200 on the 32S-3 dial). The hairline indicator should be vertical in the dial window. If there is no end-point spread, but the hairline is slanted to left or right, loosen the setscrews on the dial hub, and slip the dial mechanism on the oscillator shaft until zero beat occurs with the hairline vertical.

If there is endpoint spread, correct it as follows before correcting a slanting hairline:

- a. Zero beat the 32S-3 output against the 100-kc calibrator signal at 3800 kc, and set the 32S-3 hairline right on 200.
- b. Zero beat the 32S-3 output against the 100-kc calibrator signal at 3600 kc. Note the difference in kilocycles between the hairline and 0 on the 32S-3 dial (for example, -1.5 kc).
- c. Without moving the hairline, move the dial to the opposite side of 0 by an amount equal to the frequency difference noted above (for example, +1.5 kc).
- d. Adjust L302 for zero beat. It is located on top of the vfo can.
- e. Set the 32S-3 hairline over the 0.
- f. Check zero beat at 200 on the dial (3800 kc). If zero beat does not occur at exactly 200, repeat steps a through e.
- g. If, after adjustment of end points, the 32S-3 hairline is not vertical in the dial window, loosen the setscrews on the dial hub, and move the dial with respect to the oscillator shaft so that zero beat occurs with the end points (0 and 200) set at center.
- h. After these adjustments of the vfo calibration, recheck the vfo sideband frequency shift adjustment according to paragraph 4.5.4.
- i. This completes the field alignment procedure. Turn 32S-3 off, disconnect dummy load, and return 32S-3 to service.

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Service Instructions

4.6 Laboratory Alignment Procedures.

4.6.1 LABORATORY ALIGNMENT.

Laboratory alignment of the 32S-3 is performed only when extensive component replacement has taken place or when the 32S-3 is being placed in service after a long period of storage. These adjustments should be performed by a skilled technician. Laboratory alignment requires the 32S-2 to be removed from its cabinet. Refer to paragraph 4.1 for removal instructions.

4.6.2 TEST EQUIPMENT REQUIRED.

Test equipments required for laboratory alignment of the 32S-3 are a 50-ohm, 100-watt dummy load, a receiver with a 100-kc crystal calibrator and an S-meter, an rf signal generator, an audio oscillator, and a vtvm with an rf probe.

4.6.3 455-KC IF. ALIGNMENT.

a. Connect a vtvm rf probe across the mechanical filter input (junction of C140 and R106 on terminal strip near if. amplifier V3).

b. Connect the output of the audio oscillator to PHONE PATCH or MIC jack. Set the audio oscillator frequency to 1000 CPS and 30- to 50-millivolt output.

c. Activate the PTT line by setting VOX GAIN control to PTT ON. Adjust MIC GAIN control for an indication of approximately 1 volt on the vtvm.

d. Adjust the slug in T2 for peak output. Disconnect the vtvm and audio oscillator. Deactivate PTT.

4.6.4 BANDPASS IF. ALIGNMENT.

For this step through 4.6.14, the 32S-3 must be removed from its cabinet. Refer to paragraph 4.1 for cabinet removal instructions.

a. Connect signal generator output between pin 2 of the first mixer, V4, and ground. Connect rf probe of vtvm between junction of C30 and R32 and ground. This point is in the grid circuit of second mixer V5.

b. Tune the signal generator to 3.055 mc. Make a swamping tool by connecting a 1000-ohm resistor and a 0.01-uf capacitor in series and connecting clips to their free pigtails. Connect this swamping tool

across terminal 3 (secondary winding) of T1 and ground. This terminal is connected to the T1 end of coupling capacitor C3.

c. Turn on transmitter. Set FREQ CONTROL switch to REC VFO, and set EMISSION switch to TUNE.

d. Keep vtvm indication at about 0.5 volt by adjusting signal generator output. Peak the primary of T1 and peak L4 with tuning tool, such as Walsco 2543. The primary slug for T1 is in the bottom of the can.

e. Remove the swamping tool from the secondary of T1, and connect it across the primary of T1 (between pins 1 and 6 of first mixer V4). Peak the secondary of T1 (top of shield can). Remove swamping tool.

4.6.5 RF CIRCUITS ALIGNMENT.

For ordinary touchup of alignment, it is only necessary to tune and load in the normal manner, and then touch up the trimmer capacitor settings for maximum grid drive. Keep grid drive low with the MIC GAIN control. It is advisable to perform this alignment with the transmitter PA feeding a well-shielded dummy load. If rf circuit components have been replaced, or if any extensive repairs have been made in the rf section, proceed as follows:

a. Adjust (A) 3.5 trimmers (C101, C41, C52, and C69) to 2/3 maximum capacity. Adjust C65, (C)14 DRIVER PLATE trimmer, to 1/3 maximum capacity. Adjust all other ceramic trimmer capacitors, except CAR BAL capacitor C11, at 1/2 maximum capacity. Make no changes in settings of neutralizing capacitors C55, C57, and C71. Figure 4-2 shows maximum, minimum, and half-capacity settings of ceramic trimmers.

b. Set BAND switch to 3.6, tuning dial to 100, and EXCITER TUNING to 2.4 on the logging scale. Set EMISSION switch to TUNE for all the following steps, and set METER switch to P.A. GRID.

CAUTION

Keep MIC GAIN setting low to protect PA. Check frequently to be sure the PA is resonated.

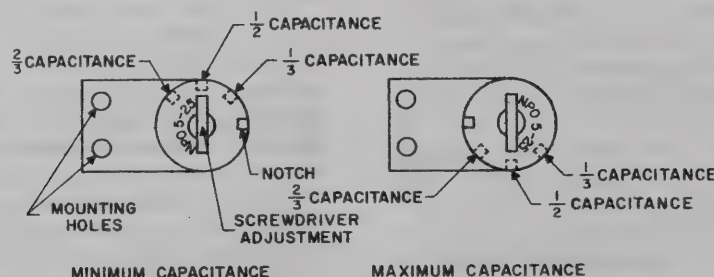


Figure 4-2. Ceramic Trimmer Capacitors

c. Adjust MIC GAIN control for approximately 1/4-scale grid current. Tune and load 32S-3 into dummy load. If grid current cannot be obtained, place the vtvm probe across 50-ohm load (use output voltage as an indication), and adjust MIC GAIN control until alignment is such that grid current can be obtained.

d. Adjust all slugs, except rear L11, for maximum grid current. Reduce MIC GAIN setting as necessary to keep grid current indication below 1/4 scale. Make no adjustment to rear slug L11 at this time. Return MIC GAIN control to minimum setting.

NOTE

If slugs must be turned more than two turns in either direction, the unit has a defect other than alignment. Troubleshoot the unit.

CAUTION

Be sure slugs are not tuned to the variable if. (3.155 to 2.955 mc). Avoid this by first turning the slugs two turns counterclockwise, then turn them clockwise to peak grid current.

e. Set BAND switch to 14.0, tuning dial to 100, and EXCITER TUNING to 6.5 on logging scale.

f. Adjust MIC GAIN for 1/4-scale grid current. Tune and load PA into dummy load. Adjust rear slug L11 and (C)14 trimmers for peak grid current, keeping grid current below 1/4-scale with MIC GAIN control. Return MIC GAIN to minimum setting.

g. Set BAND switch to 28A, tuning dial to 100, and EXCITER TUNING to 8.9 on logging scale.

h. Adjust MIC GAIN for 1/4-scale grid current. Tune and load PA into dummy load. Adjust (E)28 trimmers for peak grid current, keeping grid current below 1/4-scale with MIC GAIN control. Return MIC GAIN to minimum setting.

i. Set BAND switch to 21.2, tuning dial to 100, and EXCITER TUNING to 7.8 on logging scale.

j. Adjust MIC GAIN for 1/4-scale grid current. Tune and load PA into dummy load. Adjust (D)21 trimmers for peak grid current, keeping grid current below 1/4-scale with MIC GAIN control. Return MIC GAIN to minimum setting.

k. Repeat steps e and f except do not adjust L11.

l. Set BAND switch to 7.0, tuning dial to 150, and EXCITER TUNING to 3.8 on logging scale.

m. Adjust MIC GAIN for 1/4-scale grid current. Tune and load PA into dummy load. Adjust (B)7.0 trimmers for peak grid current, keeping grid current below 1/4-scale with MIC GAIN control. Return MIC GAIN to minimum setting.

n. Repeat steps b and c except set EXCITER TUNING to 2.2 on the logging scale. Adjust all (A)3.5 trimmers for peak grid current, keeping grid current below 1/4-scale with MIC GAIN control. Return MIC GAIN to minimum setting.

4.6.6 VFO SIDEBAND FREQUENCY SHIFT ADJUSTMENT.

Refer to paragraph 4.5.4 for vfo sideband frequency shift adjustment procedure.

4.6.7 CARRIER BALANCE (NULL) ADJUSTMENT.

Refer to paragraph 4.5.5 for carrier balance adjustment procedure.

4.6.8 ALC ZERO ADJUSTMENT.

Refer to paragraph 4.5.6 for alc zero adjustment procedure.

4.6.9 FIRST MIXER BALANCE ADJUSTMENT.

Refer to paragraph 4.5.7 for first mixer balance adjustment procedure.

4.6.10 VFO DIAL CALIBRATION.

Refer to paragraph 4.5.8 for vfo dial calibration procedure.

4.6.11 PA NEUTRALIZING.

a. Disconnect the high voltage (800 volts) from the transmitter by disconnecting the high-voltage lead at the power supply.

b. Disable the screen circuit of the PA tubes by unsoldering one end of the jumper between P.A. DISABLE jacks J9 and J5.

c. Connect a 50-ohm, noninductive, 100-watt dummy load to R.F. OUT jack J12.

d. Connect vtvm rf probe across 50-ohm dummy load.

e. Set FREQ CONTROL switch to TRANS VFO, BAND switch to 28A, EMISSION switch to LOCK KEY, and METER switch to P.A. GRID. Set dial to 100.

f. Advance MIC GAIN setting as necessary, and adjust EXCITER TUNING for peak PA grid current.

g. Adjust P.A. TUNING control for maximum rf voltage indication on vtvm. Adjust MIC GAIN as necessary to keep this indication below 0.5 volt.

h. From bottom chassis, adjust the PA neutralizing capacitor, C71, for a dip in the vtvm indication. This voltage is PA plate feedthrough.

i. Remove the rf probe connection from the 50-ohm load.

4.6.12 DRIVER NEUTRALIZING.

a. Restore high voltage to the PA tubes by connecting the high-voltage lead at the power supply. Reconnect the jumper between J5 and J9 PA DISABLE jacks.

b. Remove the filament voltage to driver tube V7 by unsoldering the lead connected to pin 5. As an alternative, an old 6CL6 tube with no shorts and with pin 4 or 5 clipped off may be substituted for V7.

c. Connect the rf probe of the vtvm across the dummy load at J12.

d. Set the FREQ CONTROL switch to TRANS VFO, BAND switch to 28A, EMISSION switch to LOCK KEY, and METER switch to P.A. PLATE.

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e. Set PA bias for 40-ma static plate current.
f. Increase MIC GAIN setting, and adjust EXCITER TUNING and P.A. TUNING controls for maximum voltage across the 50-ohm load. This level will be less than 0.3 volt.

g. Adjust driver neutralizing capacitor C57 for a voltage dip. This capacitor is located on the shield partition closest to the shield can. Refer to figure 4-1.

h. Restore V7 to normal operation.

4.6.13 FEEDBACK NEUTRALIZING.

a. Set FREQ CONTROL to TRANS VFO position, BAND switch to 28A position, EMISSION switch to TUNE, and METER switch to P.A. PLATE position.

b. Adjust EXCITER TUNING control for a peak in PA plate current.

c. Dip the PA plate current with the P.A. TUNING control.

d. Repeat steps b and c above.

e. Adjust feedback neutralizing capacitor C55 (below chassis) until the PA plate current dip and the grid current dip coincide. Readjust the MIC GAIN as necessary to hold PA grid current to midscale during this adjustment.

f. Set BAND switch to 21.2, peak EXCITER TUNING control, and dip PA plate current with P.A. TUNING control.

g. Check that PA plate current dip and PA grid current dip occur at same setting of P.A. TUNING control.

h. Repeat this check on bands 14.2, 7.0, and 3.6.

4.6.14 PA LOADING TRIMMER ADJUSTMENTS.

These trimmer capacitors are adjusted to provide the required total output capacity for matching 50-ohm antenna loads on the amateur bands with the INCR LOAD control set at the 50 Ω mark. Normally, they will not need readjustment, since, when the PA is properly loaded, the tuning is relatively broad. If it is determined that adjustment is necessary, proceed as follows:

a. Refer to figure 6-4 for location of the loading trimmers.

b. Connect a 50-ohm nonreactive dummy load to the 32S-3 RF OUT jack.

c. Set INCREASE LOADING control to the 50 Ω mark.

d. Tune the 32S-3 at 21.3 mc, and set the EMISSION switch to LOCK KEY.

e. Set MIC GAIN to the point which begins to produce PA GRID current, that is, grid current threshold.

f. Adjust C146 until the PA draws 230-ma plate current at the dip.

g. Tune the 32S-3 at 28.6 mc, and check the PA plate current. If not 230 ma, readjust C146 for best compromise between the 21.3- and 28.6-mc plate current readings.

h. Tune the 32S-3 at 14.150 mc. Set the MIC GAIN to grid current threshold.

i. Adjust C80 as in step f.

j. Tune the 32S-3 at 7.150 mc. Set the MIC GAIN to grid current threshold.

k. Adjust C135 as in step f.

l. Tune the 32S-3 at 3.700 mc. Set the MIC GAIN to grid current threshold.

m. Adjust C136 as in step f.

4.7 Dial Cord Replacement. (Refer to figure 4-3.)

4.7.1 BANDSWITCH CORD.

a. Place BAND switch in position 2A. Remove all power from 32S-3, and remove PA compartment top cover. Short the PA plates to ground with a screwdriver blade. Check to see that the movable contacts of both S5 and S6 are at position 13 and 14. This may be determined by counting clockwise on the wafer from the S-mark, looking at the wafer on the side marked with the X, and beginning with the first position clockwise from the X-mark as 1. Count all positions, including the holes in the empty spaces where there are no lugs mounted.

b. Use a knife blade or small screwdriver to pry the tab open far enough to release the old cord. This tab is located on the inner face of the pulley. Remove the broken or defective cord from the band-switch pulleys near the front panel. One is located above the chassis and the other below the chassis. Loosen the idler pulley so it will not be in the way during restringing.

c. Replace the old cord with three feet of new cord, Collins part number 432-1009-00. When ordering dial cord, be sure to state the desired length in feet.

d. String the cord according to the appropriate part of figure 4-3. Make sure the cord turns do not overlap on the pulleys. Pull the cord tight, and tie to the tab. Make sure a short piece of spaghetti is slipped over the plastic covered cord so that it acts as extra insulation under the tab. This prevents rf currents from melting the plastic and shorting the wire core to ground. Mash the tab down to clamp the cord securely. Tighten the idler to bring the cord to tension.

e. Check again that switch sections S5 and S6 are properly positioned according to the instructions of step a above. If they are not, loosen the shaft coupler, and turn the switch shaft to bring the contacts to proper position. Tighten the coupler.

f. Apply a little airplane cement on dial cord knots to help keep them tight. After cement is dry, trim the loose ends back not closer than 1/2 inch from knots.

4.7.2 LOADING CAPACITOR CORD.

a. Place INCR LOAD control at 10 on the logging scale. This positions the INCR LOAD control horizontally and points at the meter. Remove all power from the 32S-3, and remove the PA compartment top cover. Short the PA plate caps to ground with a screwdriver blade. Check that the loading capacitor is fully meshed.

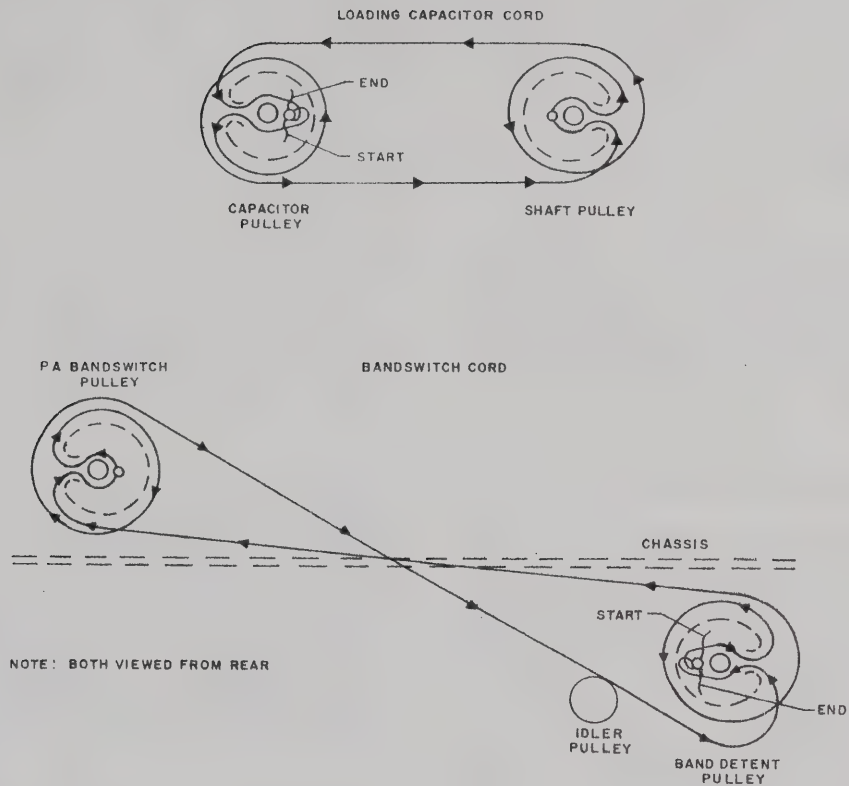


Figure 4-3. Dial Cord Stringing Diagram

b. Use a knife or small screwdriver, and pry the tab open far enough to release the old cord. Remove the broken or defective dial cord from the loading capacitor pulleys.

c. Replace the old cord with two feet of new cord, Collins part number 432-1009-00. When ordering dial cord, be sure to state the desired length in feet.

d. String the cord according to the appropriate part of figure 4-3. Make sure the cord turns do not overlap on the pulleys. Pull the cord tight, and tie to the tab. Make sure a short piece of spaghetti is slipped over the plastic covered cord so that it acts as extra

insulation under the tab. This prevents rf currents from melting the plastic and shorting the wire cord to ground. Mash the tab down to clamp the cord securely.

e. Check to see that the INCR LOAD control is at 10 on the logging scale and that the loading capacitor is fully meshed. If not, loosen the shaft coupler, mesh the capacitor plates manually, and tighten the coupler.

f. Dab a little airplane cement on the knots in the dial cords to help hold them tight. After the cement is dry, trim the loose ends back not closer than 1/2 inch from the knot.

5.1 32S-3 Transmitter.

The 32S-3 Transmitter develops a minimum of 100 watts output power on 80-, 40-, and 20-meter amateur bands. Power output is 90 watts minimum on 15 meters and 80 watts minimum on 10 meters.

5.2 Frequency Coverage

The 32S-3 has band-switch positions and corresponding crystal sockets for fourteen 200-kc bands. Crystals are furnished for complete coverage of all amateur bands except 10 meters. One 10-meter crystal is furnished, and the crystal mounting block has extra sockets for two additional crystals. One other spare crystal socket and band-switch position are provided for an additional band between 9.5 and 15.0 mc. Other crystals may be substituted for those furnished to place the transmitter at other frequencies throughout the range.

5.3 Requirements for Operation.

The transmitter requires the following power supply voltages:

- +800 volts dc at 230 ma for PA plates.
- +275 volts dc at 190 ma for PA screens and low-voltage plates.
- Bias voltage adjustable between -60 and -80 volts dc.
- 6.3 volts ac at 6.0 amperes
- or
- 6.0 volts dc at 6.0 amperes
- or
- 12.0 to 14.0 volts dc at 3.0 amperes
- or
- 24.0 to 28.0 volts dc at 1.5 amperes

These voltages may be supplied by Collins power supplies 516F-2 (115-volt ac source), MP-1 (12-volt dc source), or 516E-2 (24-volt dc source). The antenna and feed system must present a 50- to 75-ohm load with swr not exceeding 2.0 to 1. Any high impedance crystal or dynamic microphone and any key may be used with the 32S-3 Transmitter. Since some crystal and ceramic microphones peak at the same frequency as some speaker systems, antiovx operation can be erratic. A dynamic microphone is recommended.

5.4 Specifications.

Size	6-9/16 inches high, 14-3/4 inches wide, 11-1/2 inches deep.
Weight	16 pounds.
Frequency range	3.4 to 5.0 and 6.5 to 30.0 megacycles. With crystals furnished, bands are as follows: <ul style="list-style-type: none"> 80 meters - 3.4 to 3.6 mc, 3.6 to 3.8 mc, and 3.8 to 4.0 mc. 40 meters - 7.0 to 7.2 mc, and 7.2 to 7.4 mc. 20 meters - 14.0 to 14.2 mc, and 14.2 to 14.4 mc. 15 meters - 21.0 to 21.2 mc, 21.2 to 21.4 mc, and 21.4 to 21.6 mc. 10 meters - 28.5 to 28.7 mc.
Mode	Single sideband (either sideband selectable) or CW.
Type of service	SSB continuous; CW 50-percent duty cycle.
Plate power input	175 watts PEP on SSB, 160 watts on CW.
Power output	100 watts PEP (nominal) into 50 ohms, 80, 40, and 20 meters. 90 watts on 15 meters, and 80 watts on 10 meters.
Microphone input impedance	High impedance.

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Specifications

Rf output impedance	30 to 80 ohms with not more than 2.0 to 1 swr.
Frequency stability	Total variation after warmup not more than 100 cps.
Calibration accuracy	1 kilocycle after midband calibration.
Keying.	Modified break-in.
Audio-frequency response	300-2400 cps ± 6 db nominal.
Carrier suppression.	Carrier 50 db below 2-tone full output signal.
Unwanted sideband	50 db down from 2-tone full output signal.
Oscillator feedthrough or mixer products (undesired)	50 db down from 2-tone full output signal.
Second harmonic	40 db down from 2-tone full output signal.
Third order distortion	30 db down from 2-tone full output signal.

5.5 Tube, Fuse, and Semiconductor Complement.

TABLE 5-1. TUBES, FUSES, AND SEMICONDUCTORS

SYMBOL	FUNCTION	TYPE
V1A	First audio amplifier	1/2 6U8A
V1B	Second audio amplifier	1/2 6U8A
V2A	Cathode follower	1/2 6U8A
V2B	Beat-frequency oscillator	1/2 6U8A
V3	If. amplifier	6CB6
V4	First mixer	12AT7
V5	Second mixer	12AT7
V6	Rf amplifier	6AH6
V7	Driver	6CL6
V8	Power amplifier	6146
V9	Power amplifier	6146
V10	Vox/antivox rectifier	6AL5
V11A	Vox relay actuator	1/2 6U8A
V11B	Tone oscillator	1/2 6U8A
V12	Crystal oscillator	6CB6
V13	Voltage regulator	0A2
V14A	Vox amplifier	1/2 12AT7
V14B	Antivox amplifier	1/2 12AT7

TABLE 5-1. TUBES, FUSES, AND SEMICONDUCTORS (Cont)

SYMBOL	FUNCTION	TYPE
V301	Vfo	7543
CR1, CR2 CR3, CR4	Balanced modulator	FA4000
CR301	Frequency shift switch	1N34A
CR5, CR6	Alc rectifier	1N458
CR7	Sidetone limiter	1N458
CR8	Vox limiter	1N458
F1	Fuse, 6.3 vac output jack	2 amp, 125 v

5.6 Available Accessories.

TABLE 5-2. AVAILABLE ACCESSORIES

ITEM	FUNCTION	COLLINS PART NUMBER
312B-4 Station Control	Speaker, phone patch directional wattmeter, and station control	522-1167-00
MP-1	Mobile power supply for 12-volt source	522-2750-00
516F-2 AC Power Supply	Ac power supply	522-1170-00
516E-2 DC Power Supply	Dc power supply for 24-volt source	522-0846-00
Extra crystals	Additional band coverage	See section 6, Parts List
4-foot rf cables	Extra rf patch cables	426-5076-00
4-foot shielded cables	Extra nonrf patch cables	426-2027-00
351E-1 Mounting Frame	Mount for 32S-3	522-1479-00
351E-2 Mounting Frame	Mount for 312B-4	522-1480-00
302C-3 Directional Wattmeter	Measure forward and reflected power	522-2051-00
399B-4 Novice Adapter	Provides crystal control in place of vfo	522-1780-00

6

section

parts list

ITEM	DESCRIPTION	COLLINS PART NUMBER
32S-3 TRANSMITTER		522-2955-00
C1	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 0.1 uf, -20% +80%, 500 v dc; Sprague Electric Co. of Wisconsin part no. 41C92	913-3152-00
C2	CAPACITOR, FIXED, MICA: 220 uuf, $\pm 5\%$, 500 v dc; Electro Motive part no. DM10F221J	912-3903-00
C3	CAPACITOR, FIXED, CERAMIC: 4700 uuf, $\pm 20\%$, 500 v dc Solar Mfg. Corp	913-3012-00
C4	CAPACITOR, FIXED, CERAMIC DIELECTRIC: Same as C1	913-3152-00
C5	CAPACITOR, FIXED, CERAMIC: 0.02 uf, $\pm 100\%$ -20%, 500 v dc; Erie Resistor Corp part no. 841011 W5VO 203Z	913-2142-00
C6	CAPACITOR, FIXED, ELECTROLYTIC: dual section, 8 uf, $\pm 75\%$ -10%, 300 v dc; 25 uf, $\pm 75\%$ -10%, 25 v dc; Sprague Electric Co. part no. D27958	183-1479-00
C7	NOT USED	
C8	CAPACITOR, FIXED, ELECTROLYTIC: 4 uf, -10% +100%, 350 v dc; Sprague Electric Co. part no. D29343	183-1783-00
C9	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1 uf, $\pm 80\%$ -20%, 25 v dc; Sprague Electric Co. part no. 5C13A	913-3810-000
C10	CAPACITOR, FIXED, CERAMIC: 10,000 uf, $\pm 20\%$, 500 v dc; Solar Mfg. Corp.	913-3013-00
C11	CAPACITOR, VARIABLE, CERAMIC: 5.0 uuf min to 25.0 uuf max, 350 v dc; Erie Resistor Corp. part no. 557006 COPO39R	917-1194-00
*C12	CAPACITOR, FIXED, MICA: 5 uuf 5%, 500 v dc; Electro Motive part no. DM10C050J	912-3836-000
*C12	CAPACITOR, FIXED, MICA: 10 uuf 5%, 500 v dc; Electro Motive part no. DM10C100J	912-3837-000
*C12	CAPACITOR, FIXED, MICA: 15 uuf 5%, 500 v dc; Electro Motive part no. DM10C150J	912-3841-000
*C12	CAPACITOR, FIXED, MICA: 20 uuf 5%, 500 v dc; Electro Motive part no. DM10E200J	912-3841-000
*C12	CAPACITOR, FIXED, MICA: 24 uuf 5%, 500 v dc; Electro Motive part no. DM10E240J	912-3843-000
*C12	CAPACITOR, FIXED, MICA: 27 uuf 5%, 500 v dc; Electro Motive part no. DM10E270J	912-3844-000
*C12	CAPACITOR, FIXED, MICA: 33 uuf 5%, 500 v dc; Electro Motive part no. DM10E330J	912-3848-000
*C12	CAPACITOR, FIXED, MICA: 39 uuf 5%, 500 v dc; Electro Motive part no. DM10E390J	912-3852-000
*C12	CAPACITOR, FIXED, MICA: 43 uuf 5%, 500 v dc; Electro Motive part no. DM10E430J	912-3854-000
*C12	CAPACITOR, FIXED, MICA: 47 uuf 5%, 500 v dc; Electro Motive part no. DM10E470J	912-3856-000
*C12	CAPACITOR, FIXED, MICA: 51 uuf 5%, 500 v dc; Electro Motive part no. DM10E510J	912-3858-000
*C12	CAPACITOR, FIXED, MICA: 56 uuf 5%, 500 v dc; Electro Motive part no. DM10F560J	912-3861-000
*C12	CAPACITOR, FIXED, MICA: 62 uuf 5%, 500 v dc; Electro Motive part no. DM10F620J	912-3864-000
*C12	CAPACITOR, FIXED, MICA: 68 uuf 5%, 500 v dc; Electro Motive part no. DM10F680J	912-3867-000
*C12	CAPACITOR, FIXED, MICA: 75 uuf 5%, 500 v dc; Electro Motive part no. DM10F750J	912-3870-000
*C12	CAPACITOR, FIXED, MICA: 82 uuf 5%, 500 v dc; Electro Motive part no. DM10F820J	912-3873-000
*C12	CAPACITOR, FIXED, MICA: 91 uuf 5%, 500 v dc; Electro Motive part no. DM10F910J	912-3876-000
*C12	CAPACITOR, FIXED, MICA: 100 uuf 5%, 500 v dc; Electro Motive part no. DM10F101J	912-3879-000
*Chosen per operational requirements.		

ITEM	DESCRIPTION	COLLINS PART NUMBER
*C12	CAPACITOR, FIXED, MICA: 110 uuf 5%, 500 v dc; Electro Motive part no. DM10F111J	912-3882-000
*C12	CAPACITOR, FIXED, MICA: 120 uuf 5%, 500 v dc; Electro Motive part no. DM10F121J	912-3885-000
*C12	CAPACITOR, FIXED, MICA: 130 uuf 5%, 500 v dc; Electro Motive part no. DM10F131J	912-3888-000
C13	CAPACITOR, FIXED, CERAMIC: same as C10	913-3013-00
C14	CAPACITOR, FIXED, CERAMIC DIELECTRIC: same as C1	913-3152-00
C15, C16	CAPACITOR, FIXED, CERAMIC: same as C10	913-3013-00
C17	CAPACITOR, FIXED, MICA: 180 uuf, $\pm 5\%$, 500 v dc; Electro Motive part no. DM10F181J	912-3897-00
C18	CAPACITOR, FIXED, MICA: same as C2	912-3903-00
C19	CAPACITOR, FIXED, MICA: same as C2	
C20	CAPACITOR, FIXED, CERAMIC: same as C10	913-3013-00
C21	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 2200 uuf $\pm 20\%$, 500 v dc	913-3011-00
C22	CAPACITOR, FIXED, CERAMIC: same as C10	913-3013-00
C23	CAPACITOR, FIXED, MICA: 10 uuf, $\pm 5\%$, 500 v dc; Electro Motive part no. DM10C100J	912-3837-00
C24	P/O T1	
C25	P/O T1	
C26	CAPACITOR, VARIABLE, CERAMIC: same as C11	917-1194-00
C27	P/O L4	
C28	CAPACITOR, FIXED, CERAMIC: 6 uuf, $\pm 1/2$ uuf, 500 v dc; MIL Type CC20CH060D	916-0122-000
C29	P/O L4	
C30	CAPACITOR, FIXED, CERAMIC: 1000 uuf, $\pm 100\%$ -20%, 500 v dc; Erie Resistor Corp part no. 851000 X5U0 102Z	913-3009-00
C31	CAPACITOR, FIXED, CERAMIC: same as C30	913-3009-00
C32	CAPACITOR, FIXED, CERAMIC: same as C10	913-3013-00
C33	CAPACITOR, FIXED, MICA: same as C23	912-3837-00
C34	CAPACITOR, FIXED, MICA: same as C23	912-3837-00
C35	CAPACITOR, VARIABLE, CERAMIC: same as C11	917-1194-00
C36	CAPACITOR, VARIABLE, CERAMIC: 8 uuf min to 50 uuf max, 350 v dc; Erie Resistor Corp part no. 557006 U2PO 34R	917-1196-00
C37	CAPACITOR, VARIABLE, CERAMIC: same as C36	917-1196-00
C38	CAPACITOR, FIXED, MICA: 51 uuf, $\pm 5\%$, 500 v dc; Electro Motive part no. DM10E510J	912-3858-00
C39	CAPACITOR, VARIABLE, CERAMIC: same as C36	917-1196-00
C40	CAPACITOR, FIXED, MICA: 240 uuf, $\pm 2\%$, 500 v dc; Electro Motive part no. DM15F241G-5000WV	912-2842-00
C41	CAPACITOR, VARIABLE, CERAMIC: same as C36	917-1196-00
C42	CAPACITOR, FIXED, MICA: 680 uuf, $\pm 2\%$, 300 v dc; Electro Motive Co. part no. DM15E681G-300WV	912-3498-00
C43	CAPACITOR, FIXED, CERAMIC: same as C10	913-3013-00
C44	CAPACITOR, FIXED, CERAMIC: same as C10	913-3013-00
C45	CAPACITOR, FIXED, CERAMIC: same as C30	913-3009-00
C46	CAPACITOR, VARIABLE, CERAMIC: same as C11	917-1194-00
C47	CAPACITOR, VARIABLE, CERAMIC: same as C36	917-1196-00
C48	CAPACITOR, VARIABLE, CERAMIC: same as C36	917-1196-00
C49	CAPACITOR, FIXED, MICA: same as C38	912-3858-00
C50	CAPACITOR, VARIABLE, CERAMIC: same as C36	917-1196-00
C51	CAPACITOR, FIXED, MICA: same as C40	912-2842-00

SECTION 6
Parts List

ITEM	DESCRIPTION	COLLINS PART NUMBER
C52	CAPACITOR, VARIABLE, CERAMIC: same as C36	917-1196-00
C53	CAPACITOR, FIXED, MICA: 360 uuf, $\pm 2\%$, 500 v dc; Electro Motive part no. DM15F361G-500WV	912-2854-00
C54	CAPACITOR, FIXED, MICA: same as C2	912-3903-00
C55	CAPACITOR, VARIABLE, CERAMIC: same as C36	917-1196-00
C56	CAPACITOR, FIXED, CERAMIC: 1000 uuf, $\pm 10\%$, 500 v dc; Erie Resistor Corp. part no. SK10066S	912-5232-00
C57	CAPACITOR, VARIABLE, CERAMIC: 1.5 uuf min to 7.0 uuf max, 350 v dc; Erie Resistor Corp. part no. 557006 COPO 10R	917-1192-00
C58	CAPACITOR, FIXED, CERAMIC: same as C10	913-3013-00
C59	CAPACITOR, FIXED, CERAMIC: same as C10	913-3013-00
C60	CAPACITOR, FIXED, CERAMIC: same as C3	913-3012-00
C61	CAPACITOR, FIXED, CERAMIC: 15 uuf $\pm 10\%$, 5000 v dc; Centralab part no. 854-15N	913-1401-00
C62	CAPACITOR, FIXED, CERAMIC: same as C56	913-4061-00
C63	CAPACITOR, VARIABLE, CERAMIC: same as C11	917-1194-00
C64	CAPACITOR, VARIABLE, CERAMIC: same as C11	917-1194-00
C65	CAPACITOR, VARIABLE, CERAMIC: same as C36	917-1196-00
C66	CAPACITOR, FIXED, MICA: same as C38	912-3858-00
C67	CAPACITOR, VARIABLE, CERAMIC: same as C36	917-1196-00
C68	CAPACITOR, FIXED, CERAMIC: same as C10	913-3013-00
C69	CAPACITOR, VARIABLE, CERAMIC: same as C36	917-1196-00
C70	CAPACITOR, FIXED, MICA: same as C2	912-3903-00
C71	CAPACITOR, VARIABLE, AIR: 1.8 uuf min to 50 uuf max, 1250 v ac; E. F. Johnson part no. 160-104-3	922-0031-00
C72	CAPACITOR, FIXED, CERAMIC: 1000 uuf, $\pm 20\%$, 2000 v dc; Erie Resistor Corp. 858WST2KV	913-4803-00
C73 thru C75 C76 C77	CAPACITOR, FIXED, CERAMIC: same as C10	913-3013-00
C78	CAPACITOR, FIXED, CERAMIC: same as C72	913-4803-00
C79	CAPACITOR, VARIABLE, AIR: 12.0 uuf min to 250.0 uuf max, 1000 v rms; Hammerlund Co., Inc. part no. 4112-26	920-0136-00
C78	CAPACITOR, FIXED, MICA: 33 uuf, $\pm 5\%$, 500 v dc; Electro Motive Mfg. Co. part no. DM10E330J	912-3848-00
C79	CAPACITOR, FIXED, MICA: 130 uuf, $\pm 5\%$, 500 v dc; Electro Motive part no. DM15F131J-500WV	912-2825-00
C80	CAPACITOR, VARIABLE, MICA: 100 uuf to 500 uuf; 1000 v dc; Electro Motive part no. PD 52414	918-0006-00
C81	CAPACITOR, FIXED, CERAMIC: same as C3	913-3012-00
C82	CAPACITOR, FIXED, CERAMIC: same as C5	913-2142-00
C83	CAPACITOR, FIXED, CERAMIC: same as C1	913-3152-00
C84	CAPACITOR, FIXED, CERAMIC: same as C3	913-3012-00
C85	CAPACITOR, FIXED, CERAMIC: same as C10	913-3013-00
C86	P/O T2	
C87	CAPACITOR, FIXED, CERAMIC: same as C1	913-3152-00
C88	CAPACITOR, FIXED, CERAMIC: 0.47 uf -20% +80%, 25 v dc; Sprague part no. 5C11A	913-3804-00
C89	CAPACITOR, FIXED, MICA: 15 uuf, $\pm 5\%$, 500 v dc; Electro Motive part no. DM10C150J	912-3839-00
C90	CAPACITOR, FIXED, MICA: 100 uuf, $\pm 5\%$, 500 v dc; Electro Motive part no. DM10F101J	912-3879-00
C91	CAPACITOR, FIXED, MICA: 1000 uuf, $\pm 5\%$, 500 v dc; Electro Motive part no. DM19F102J-500WV	912-3001-00
C92	CAPACITOR, FIXED, CERAMIC: same as C10	913-3013-00
C93	CAPACITOR, FIXED, MICA: same as C89	912-3839-00
C94	CAPACITOR, FIXED, MICA: same as C78	912-3848-00
C95	CAPACITOR, VARIABLE, CERAMIC: same as C11	917-1194-00
C96	CAPACITOR, VARIABLE, CERAMIC: same as C11	917-1194-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
C97	CAPACITOR, VARIABLE, CERAMIC: same as C36	917-1196-00
C98	P/O T1	
C99	CAPACITOR, VARIABLE, CERAMIC: same as C36	917-1196-00
C100	CAPACITOR, FIXED, MICA: 200 uuf, $\pm 10\%$, 500 v dc; Electro Motive Co. part no. DM15F201K-500WV	912-2838-00
C101	CAPACITOR, VARIABLE, CERAMIC: same as C36	917-1196-00
C102	CAPACITOR, FIXED, MICA: 270 uuf, $\pm 5\%$, 500 v dc; Electro Motive part no. DM15F271J-500WV	912-2846-00
C103	CAPACITOR, FIXED, MICA: 68 uuf, $\pm 5\%$, 500 v dc; Electro Motive part no. DM10F680J	912-3867-00
C104	CAPACITOR, FIXED, CERAMIC: same as C10	913-3013-00
C105	CAPACITOR, FIXED, MICA: 82 uuf, $\pm 5\%$, 500 v dc; MIL Type CM05C820J03	912-2810-00
C106	CAPACITOR, FIXED, CERAMIC: same as C10	913-3013-00
C107	CAPACITOR, FIXED, CERAMIC: same as C1	913-3152-00
C108	CAPACITOR, FIXED, CERAMIC: same as C10	913-3013-00
C109	CAPACITOR, FIXED, MICA: 330 uuf, $\pm 5\%$, 500 v dc; Electro Motive part no. DM15F331J-500WV	912-2852-00
C110	CAPACITOR, FIXED, MICA: same as C109	912-2852-00
C111	CAPACITOR, FIXED, MICA: same as C109	912-2852-00
C112	CAPACITOR, FIXED, CERAMIC: same as C10	913-3013-00
C113	CAPACITOR, FIXED, CERAMIC: same as C10	913-3013-00
C114	NOT USED	
C115	CAPACITOR, FIXED, CERAMIC: 0.3 uf +80%, -20%, 50 v dc; Sprague part no. 5C53A	913-3816-00
C116	CAPACITOR, FIXED, CERAMIC: same as C10	913-3013-00
C117	CAPACITOR, FIXED, CERAMIC: same as C10	913-3013-00
C118	CAPACITOR, FIXED, CERAMIC: same as C1	913-3152-00
C119	CAPACITOR, FIXED, CERAMIC: same as C5	913-2142-00
C120	CAPACITOR, FIXED, CERAMIC: same as C10	913-3013-00
C121	CAPACITOR, FIXED, CERAMIC: same as C3	913-3012-00
C122	NOT USED	
C123	CAPACITOR, FIXED, CERAMIC: same as C72	913-4803-00
C124	CAPACITOR, FIXED, CERAMIC: same as C30	913-3009-00
C125	CAPACITOR, FIXED, CERAMIC: 500 uuf, $\pm 10\%$, 500 v dc; Erie Resistor Corp part no. 331013 X5U0 501K	913-0998-00
C126 thru C130	CAPACITOR, FIXED, CERAMIC: same as C125	913-0998-00
C131	CAPACITOR, FIXED, CERAMIC: same as C30	913-3009-00
C132	CAPACITOR, FIXED, MICA: 330 uuf, $\pm 2\%$, 500 v dc; Electro Motive part no. DM15F331G-500WV	912-2851-00
C133	CAPACITOR, FIXED, CERAMIC: same as C30	913-3009-00
C134	CAPACITOR, FIXED, CERAMIC: 1.0 uuf, $\pm 1/4$ uuf, 500 v dc; Centralab	916-0070-00
C135	CAPACITOR, VARIABLE, MICA: same as C80	918-0006-00
C136	CAPACITOR, VARIABLE, MICA: same as C80	918-0006-00
C137	CAPACITOR, FIXED, CERAMIC: 1000 uuf, $\pm 10\%$, -20%, 500 v dc; Erie Resistor Corp part no. 327047 X5T0 102Z	913-1292-00
C138	NOT USED	
C139	CAPACITOR, FIXED, CERAMIC: same as C10	913-3013-00
C140	CAPACITOR, FIXED, CERAMIC: same as C10	913-3013-00
C141	CAPACITOR, TUBULAR, CERAMIC: same as C28	916-0122-00
C142	CAPACITOR, FIXED, CERAMIC: same as C1	913-3152-00
C143	CAPACITOR, FIXED, ELECTROLYTIC: 20 uf, -10% +75%, 100 v dc; Sprague part no. D29691	183-1178-00
C144	CAPACITOR, FIXED, CERAMIC: 2 uuf, $\pm 1/2$ uuf, 500 v dc; Centralab	916-0076-00
C145	CAPACITOR, FIXED, CERAMIC: 0.1 uf, -30% +80%, 75 v dc; Centralab part no. DA150-001CB	913-3794-00
C146	CAPACITOR, VARIABLE, MICA: 65 uuf to 320 uuf, 1000 v dc test voltage; Electro Motive type 30	918-0010-00
C147	CAPACITOR, VARIABLE, AIR: dual section; 13.5 uuf min to 452.3 uuf max each section, 300 v ac, 60 cps min breakdown; Radio Condenser Co. part no. CN-2521574	920-0138-00
C148	CAPACITOR, FIXED, CERAMIC: same as C10	913-3013-00
C149	CAPACITOR, FIXED, MICA: same as C38	912-3858-00
C150	CAPACITOR, FIXED, CERAMIC: same as C10	913-3013-00
C155	thru	
C156	CAPACITOR, FIXED, MICA: same as C38	912-3858-00
C157	CAPACITOR, FIXED, CERAMIC: same as C10	913-3013-00
C158	CAPACITOR, FIXED, CERAMIC: 10,000 uuf $\pm 20\%$, 1000 v dc; Centralab part no. DA134-048CB	913-3922-00

SECTION 6 Parts List

ITEM	DESCRIPTION	COLLINS PART NUMBER
C159	CAPACITOR, FIXED, CERAMIC: same as C158	913-3922-00
C160	CAPACITOR, FIXED, CERAMIC: same as C10	913-3013-00
thru		
C164		
C165	CAPACITOR, FIXED, CERAMIC: same as C72	913-4803-00
C166	CAPACITOR, FIXED, CERAMIC: same as C137	913-1292-00
C167	CAPACITOR, FIXED, CERAMIC: same as C137	913-1292-00
C168	CAPACITOR, FIXED, CERAMIC: same as C30	913-3009-00
C169	CAPACITOR, FIXED, CERAMIC: same as C5	913-2142-00
C170	CAPACITOR, FIXED, CERAMIC: same as C10	913-3013-00
thru		
C172		
C173	CAPACITOR, FIXED, CERAMIC: same as C1	913-3152-00
C174	CAPACITOR, FIXED, CERAMIC: same as C10	913-3013-00
C175	CAPACITOR, FIXED, MICA: same as C90	912-3879-00
C176	CAPACITOR, FIXED, ELECTROLYTIC: same as C143	183-1178-00
C177	CAPACITOR, FIXED, ELECTROLYTIC: same as C8	183-1783-00
C178	CAPACITOR, FIXED, CERAMIC: same as C5	913-2142-00
C179	CAPACITOR, FIXED, CERAMIC: same as C3	913-3012-00
C180	CAPACITOR, FIXED, MICA: same as C90	912-3879-00
C181	CAPACITOR, FIXED, CERAMIC: 5 uuf $\pm 10\%$, 500 v dc; Centralab part no. DA855-007	913-0092-00
C182	CAPACITOR, FIXED, MICA: same as C89	912-3839-00
C183	NOT USED	
C184	CAPACITOR, FIXED, ELECTROLYTIC: same as C183	183-1165-00
C185	CAPACITOR, FIXED, ELECTROLYTIC: same as C183	183-1165-00
C186	CAPACITOR, FIXED, CERAMIC: same as C1	913-3152-00
C187	CAPACITOR, FIXED CERAMIC DIELECTRIC: 0.01 uf; G M V tolerance, 500 v dc, Centralab Division of Globe Union Inc. DA142-001CB	913-3829-00
C188	CAPACITOR, FIXED, CERAMIC DIELECTRIC: same as C1	913-3152-00
C189	CAPACITOR, FIXED, CERAMIC DIELECTRIC: same as C21	913-3011-00
C190	CAPACITOR, FIXED, CERAMIC: same as C1	913-3152-00
C191	CAPACITOR, FIXED, CERAMIC: same as C10	913-3013-00
CR1	SEMICONDUCTOR DEVICE SET: four matched silicon diodes, encapsulated; 0.2 in. by 0.468 in. by 0.5 in.; Fairchild Camera and Instrument Corp. Semiconductor Division part no. FA4000	353-3271-00
CR2	SEMICONDUCTOR DEVICE SET: same as CR1	353-3271-00
CR3	SEMICONDUCTOR DEVICE SET: same as CR1	353-3271-00
CR4	SEMICONDUCTOR DEVICE SET: same as CR1	353-3271-00
CR5	SEMICONDUCTOR DEVICE, DIODE: silicon; hermetically sealed; Hughes Aircraft Co. part no. 1N458	353-0205-00
CR6	SEMICONDUCTOR DEVICE, DIODE: same as CR5	353-0205-00
CR7	SEMICONDUCTOR DEVICE, DIODE: same as CR5	353-0205-00
CR8	SEMICONDUCTOR DEVICE, DIODE: same as CR5	353-0205-00
DS1	LAMP, INCANDESCENT: miniature, bayonet base; T-3-1/4 pilot light bulb; 6.3 v, 0.150 amp, C-212 filament; General Electric Co. part no. 47	262-3240-00
DS2	LAMP, INCANDESCENT: same as DS1 (P/O M1)	262-3240-00
F1	FUSE, CARTRIDGE, GLASS CASE: 2 amp, 250 v; part no. GJV2	264-0774-000
FL1	FILTER, MECHANICAL: 455-kc center frequency and 2.1-kc bandwidth	526-9427-00
J1	JACK, TELEPHONE: 3 circuit; J2-1F contact arrangement; 3/16 in. dia by 1 in. lg plug accommodated; 49/64 in. by 15/16 in. by 1-3/8 in. Switchcraft type JJ-033 accepts PJ-068 plug or equivalent (such as PL-68)	358-1050-00
J2	JACK, TELEPHONE: steel, miniature, panel mtd; Switchcraft, Inc. part no. 3501FP	360-0148-00
J3	JACK, TIP: accommodates 1/8 in. plug; ceramic insulation, brass contacts; Cinch Mfg. Co. part no. 201 11 01018	360-0088-00
J4	JACK, TIP: same as J3	360-0088-00
J5	JACK, TIP: same as J3	360-0088-00
J6	JACK, TELEPHONE: same as J2	360-0148-00
J7	JACK, TELEPHONE: same as J2	360-0148-00
J8	JACK, TIP: same as J3	360-0088-00
J9	JACK, TIP: same as J3	360-0088-00
J10	CONNECTOR, RECEPTACLE, ELECTRICAL: 11 male contacts, 5 amp; Amphenol Borg part no. 86-CP11-1008	372-1950-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
J11	JACK, TIP: same as J3	360-0088-00
thru		
J21		
K1	RELAY, ARMATURE: 2C, 2A contact arrangement; 50 ma at 250 v dc at/or 300 ma at 115 v ac; 6 ma dc nom coil current; 14,000 ohms $\pm 10\%$ at $+25^{\circ}\text{C}$ coil resistance; C.P. Clare Co. part no. A95183	972-1353-00
K2	RELAY, ARMATURE: antenna switching type, 2C contact arrangement, 2 amp, 175 w, 2.30 ac; 1 inductive winding, 115 v dc, 10,000 ohms; Potter & Brumfield, Inc. part no. KR-2565	970-1914-00
L1	NOT USED	
L2	COIL, RADIO FREQUENCY: single layer wound; 1000 uh $\pm 5\%$ inductance; 16 ohms max dc resistance; 700 v rms; Delevan part no. 2500-28	240-2540-00
L3	COIL, RADIO FREQUENCY: 2000 uh $\pm 5\%$ inductance; 27.5 ohms max dc resistance; 700 v rms; Delevan part no. 2500-42	240-2547-00
L4	P/O T1 (incls C27 & C29)	
L5	COIL, RADIO FREQUENCY: single layer wound, 220 uh $\pm 10\%$ inductance; 5.9 ohms dc resistance; Delevan Electronics Corp.	240-1636-00
L6	COIL, RADIO FREQUENCY: single layer wound	544-3135-002
L7	COIL, RADIO FREQUENCY: same as L5	240-1636-00
L8	COIL, RADIO FREQUENCY: same as L6	544-3135-002
L9	COIL, RADIO FREQUENCY: universal wound; 4 pi, 139 turns each; 2 mh, 100 ma; National Coil Co. part no. C-0047409	240-0134-00
L10	COIL, RADIO FREQUENCY: 22 uh, $\pm 10\%$, 0.31 ohms dc max resistance; 1330 ma; powdered iron coil form; Jeffers Electronics part no. 10404-20	240-0186-00
L11	COIL, RADIO FREQUENCY: single layer wound	543-8020-002
L12	P/O Z1	
L13	P/O Z2	
L14	COIL, RADIO FREQUENCY: single layer wound	543-8024-00
L15	TRANSFORMER, RADIO FREQUENCY: 1 winding; 1.015 in. dia by 3 in., lg	506-7848-002
L16	COIL, RADIO FREQUENCY: single layer wound	543-8123-002
L17	COIL, RADIO FREQUENCY: same as L5	240-1636-00
L18	COIL, RADIO FREQUENCY: same as L5	240-1636-00
L19	COIL, RADIO FREQUENCY: 220 uh, 65 at 790 kc; 5.3 mc resonant freq, 140 ma, 760 ohms; James Millen Mfg. Co. Inc. part no. J31-220	240-2524-00
L20	COIL, RADIO FREQUENCY: 198 turns; universal wound, 6 pi, 40 AWC: 220 uh, 7.20 ohms, 0.21 amps; shielded	756-7558-002
L21	COIL, RADIO FREQUENCY: single layer wound	544-3136-002
L22	COIL, RADIO FREQUENCY: same as L3	240-2547-00
L23	COIL, RADIO FREQUENCY: same as L2	240-2540-00
L24	COIL, RADIO FREQUENCY: multiple section duolateral wound; 4 sections; 2.5 mh, 35 to 50 ohms, 0.125 amp; Maguire Industries, Inc. part no. 02242	240-2100-00
L25	COIL, RADIO FREQUENCY: single layer wound	543-8068-00
L26	COIL, RADIO FREQUENCY: same as L3	240-2547-00
L27	COIL, RADIO FREQUENCY: same as L5	240-1636-00
L28	COIL, RADIO FREQUENCY: same as L3	240-2547-00
L29	P/O Z4	
L30	P/O Z5	
L31	COIL, RADIO FREQUENCY: 120 uh, $\pm 10\%$, 4.00 ohms max dc resistance; 425 ma; powdered iron coil form; Jeffers Electronic part no. 10404-36	240-0194-00
L32	COIL, RADIO FREQUENCY: same as L2	240-2540-00
M1	MULTIMETER: scale marked 0 thru 400 ma, 0 thru 16 db; linear, 40 scale divisions; 46 ohms meter res; 2.217 in. by 2-3/8 in. by 2-3/8 in. Electric Design Model 2-2	458-0454-00
MP1	PULLEY, IDLER: black molded polystyrene or nylon; 5/8 in. dia by 1/8 in. lg; 1/2 in. dia by 1/8 in. w groove; Ritchco Plastics Co. part no. PV-3	281-0020-00
MP2	PULLEY, FLAT: steel rim, brass body; 1.375 in. dia by 0.712 in. lg. 0.375 in. dia bore	543-7739-00
MP3	PULLEY, FLAT: steel; 1.375 in. dia by 1 in. lg overall; 0.187 in. dia bore	543-8021-002
MP4	PULLEY, IDLER: aluminum; chromate dip; 0.562 in. by 0.685 in. lg	543-8087-002
MP5	PULLEY, FLAT: steel; 1.375 in. dia by 0.508 in. lg; 0.187 in. dia bore	544-3132-002
MP6	FOOT, CABINET: aluminum; 0.984 in. dia by 0.719 in. lg	543-8101-002

SECTION 6

Parts List

ITEM	DESCRIPTION	COLLINS PART NUMBER
MP7	FOOT, CABINET: same as MP6	543-8101-002
O1	KNOB: push-on type, spring steel; 0.250 in. od, flatted 0.156 in., used with METER switch	543-8039-002
O2	KNOB: same as O1, used with EMISSION switch	543-8039-002
O3	KNOB, SPINNER: plastic; 0.859 in. by 2.078 in. by 2.515 in.	553-5787-003
O4	KNOB: same as O1, used with BAND switch	543-8039-002
O5	KNOB: same as O1, used with MIC GAIN	543-8039-002
O6	KNOB: aluminum; black semigloss enamel; 0.031 wide grooved by 0.020 in. deep; 11/16 in. dia by 11.16 in. lg, used with CW CAL	543-8039-002
O7	KNOB: same as O1, used with FREQ CONTROL	543-8039-002
O8	INDICATOR, MOLDED: black nylon; 0.861 in. dia	543-8088-002
O9	KNOB: fluted, push-on type; incl spring; spring steel w/ spring steel finish; 0.250 in. od, flatted to 0.156 in., used with EXCITER tuning	543-8044-00
O10	KNOB, FIDUCIAL: aluminum; black anodized enamel; 0.421 in. dia by 1/2 in. lg, used with zero adj	543-8078-002
O11	KNOB: phenolic; 1.009 in. w across flats by 0.750 in. thk, used with PA tuning	543-8043-00
O12	LEVER TRIMMING: nylon, black; 29/64 in. by 0.861 in. by 1.305 in., used with LOADING	544-3148-003
O13	KNOB: setscrew type, black phenolic, brass insert for 1/4 in. shaft, 13/32 in. by 1 in. dia 8-32 NC-2 setscrew supplied; Harry Davies Moulding Co. part no. 1400, used with VOX GAIN	281-0069-00
O14	KNOB: same as O13, used with ANTI-VOX GAIN	281-0069-00
O15	KNOB: same as O13, used with VOX TIME CONSTANT	281-0069-00
P1	CABLE ASSEMBLY, SPECIAL PURPOSE: 8 strands no. 36 AWG copper wire and 2 strands of no. 31 AWG bronze wire, polyethylene dielectric, single shell, polyvinyl jacket; terminated one end w/ phone-plug, other end stripped and tinned, 4 in. lg, excl terminations	426-1810-000
R1	RESISTOR, FIXED, COMPOSITION: 680 ohms, $\pm 10\%$, 1/2 w; Allen-Bradley type EB	745-1345-00
R2	RESISTOR, FIXED, COMPOSITION: 47,000 ohms, $\pm 10\%$, 1 w; Allen-Bradley type GB	745-3422-00
R3	RESISTOR, FIXED, COMPOSITION: 0.47 meg-ohms, $\pm 10\%$, 1/2 w; Allen-Bradley type EB	745-1464-00
R4	RESISTOR, FIXED, COMPOSITION: 470 ohms, $\pm 10\%$, 1/2 w; Allen-Bradley type EB	745-1338-00
R5	RESISTOR, FIXED, COMPOSITION: 47,000 ohms, $\pm 10\%$, 1/2 w; Allen-Bradley type EB	745-1422-00
R6	RESISTOR, FIXED, COMPOSITION: 0.10 meg-ohm, $\pm 10\%$, 1/2 w; Allen-Bradley type EB	745-1436-00
R7	RESISTOR, FIXED, COMPOSITION: 10,000 ohms, $\pm 10\%$, 2 w; Allen-Bradley type HB	745-5694-00
R8	RESISTOR, VARIABLE: composition; 2500 ohms one section; 500,000 2nd section; $\pm 30\%$, 1/4 w Chicago Telephone Supply type 45	376-2648-00
R9	RESISTOR, FIXED, COMPOSITION: 0.22 megohm, $\pm 10\%$, 1/2 w; Allen-Bradley type EB	745-1450-00
R10	RESISTOR, FIXED, COMPOSITION: 1000 ohms, $\pm 10\%$, 1/2 w; Allen-Bradley type EB	745-1352-00
R11	RESISTOR, FIXED, COMPOSITION: 10,000 ohms, $\pm 10\%$, 1 w; Allen-Bradley type GB	745-3394-00
R12	NOT USED	
R13	RESISTOR, FIXED, COMPOSITION: 180 ohms, $\pm 10\%$, 1/4 watt; MIL type RC07GF181	745-0722-00
R14	RESISTOR, VARIABLE: 250 ohms to $\pm 30\%$, 0.2 w	376-4602-00
R15	RESISTOR, FIXED, COMPOSITION: same as R13	745-0722-00
R16	RESISTOR, FIXED, COMPOSITION: same as R6	745-1436-00
R17	RESISTOR, FIXED, WIREWOUND: 4000 ohms, $\pm 10\%$, 7 w at 40°C; International Resistance Co. part no. PW7 4000-10PCT	710-9013-000
R18	RESISTOR, FIXED, COMPOSITION: 33,000 ohms, $\pm 10\%$, 1 w; Allen-Bradley type GB	745-3415-00
R19	RESISTOR, FIXED, COMPOSITION: 120 ohms, $\pm 10\%$, 1/2 w; Allen-Bradley EB	745-1314-00
R20	RESISTOR, VARIABLE, COMPOSITION: 250 ohms; $\pm 30\%$, 0.2 w; Chicago Telephone Supply type 70	376-4602-00
R21	RESISTOR, FIXED, COMPOSITION: 47 ohms, $\pm 10\%$, 1 w; Allen-Bradley type GB	745-3296-00
R22	RESISTOR, FIXED, COMPOSITION: 39,000 ohms, $\pm 10\%$, 1/2 w; Allen-Bradley type EB	745-1419-00
R23	RESISTOR, FIXED, COMPOSITION: 180 ohms, $\pm 10\%$, 1/2 w; Allen-Bradley type EB	745-1321-00
R24	RESISTOR, FIXED, COMPOSITION: same as R6	745-1436-00
R25	RESISTOR, FIXED, COMPOSITION: same as R6	745-1436-00
R26	RESISTOR, FIXED, COMPOSITION: 560 ohms, $\pm 10\%$, 1/2 w; Allen-Bradley type EB	745-1342-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
R27	RESISTOR, VARIABLE: composition; 500 ohms, $\pm 30\%$, 0.2 w; Chicago Telephone Supply type 70	376-4603-00
R28	RESISTOR, FIXED, COMPOSITION: same as R26	745-1342-00
R29	RESISTOR, FIXED, COMPOSITION: 4700 ohms $\pm 10\%$, 2 w; Allen-Bradley type HB	745-5680-00
R30	RESISTOR, FIXED, COMPOSITION: same as R29	745-5680-00
R31	RESISTOR, FIXED, COMPOSITION: 12,000 ohms, $\pm 10\%$, 1/2 w; Allen-Bradley type EB	745-1398-00
R32	RESISTOR, FIXED, COMPOSITION: 33 ohms $\pm 10\%$, 1/2 w; Allen-Bradley type EB	745-1299-00
R33	RESISTOR, FIXED, COMPOSITION: same as R6	745-1436-00
R34	RESISTOR, FIXED, COMPOSITION: 2200 ohms, $\pm 10\%$, 1/2 w; Allen-Bradley type EB	745-1366-00
R35	RESISTOR, FIXED, COMPOSITION: 820 ohms $\pm 10\%$, 1/2 w; Allen-Bradley type EB	745-1349-00
R36	RESISTOR, FIXED, COMPOSITION: same as R35	745-1349-00
R37	RESISTOR, FIXED, COMPOSITION: same as R6	745-1436-00
R38	RESISTOR, FIXED, COMPOSITION: 4700 ohms, $\pm 5\%$, 1/2 w; MIL type RC20GF472K	745-1380-000
R39	RESISTOR, FIXED, COMPOSITION: same as R23	745-1321-00
R40	RESISTOR, FIXED, COMPOSITION: 10,000 ohms, $\pm 10\%$, 1/2 w; Allen-Bradley type EB	745-1394-00
R41	RESISTOR, FIXED, COMPOSITION: 22,000 ohms, $\pm 10\%$, 2 w; Allen-Bradley type HB	745-5708-00
R42	RESISTOR, FIXED, COMPOSITION: 150 ohms, $\pm 10\%$, 1/2 w; Allen-Bradley type EB	745-1317-00
R43	P/O Z1	
R44	RESISTOR, FIXED, COMPOSITION: 12 ohms, $\pm 5\%$, 1/2 w; Allen-Bradley type EB	745-1271-00
R45	RESISTOR, FIXED, COMPOSITION: same as R44	745-1271-00
R46	RESISTOR, FIXED, COMPOSITION: same as R44	745-1271-00
R47	RESISTOR, FIXED, COMPOSITION: 0.47 megohm P/M 10%, 1 w; MIL Type RC32GF474K	746-3464-00
R48	P/O Z2	
R49	RESISTOR, FIXED, COMPOSITION: same as R44	745-1271-00
R51		
R52	RESISTOR, FIXED, COMPOSITION: same as R10	745-1352-00
R53	RESISTOR, FIXED, COMPOSITION: 18,000 ohms, $\pm 10\%$, 1/2 w; Allen-Bradley type EB	745-1405-00
R54	RESISTOR, FIXED, COMPOSITION: same as R10	745-1352-00
R55	RESISTOR, FIXED, COMPOSITION: 0.68 megohms, $\pm 10\%$, 1/2 w; Allen-Bradley type EB	745-1471-00
R56	RESISTOR, FIXED, COMPOSITION: 3.3 megohms, $\pm 10\%$, 1/2 w; Allen-Bradley type EB	745-1499-00
R57	RESISTOR, FIXED, COMPOSITION: 1 megohm, $\pm 10\%$, 1/2 w; Allen-Bradley type EB	745-1478-00
R58	RESISTOR, FIXED, COMPOSITION: 33,000 ohms, $\pm 10\%$, 1/2 w; Allen-Bradley type EB	745-1415-00
R59	RESISTOR, FIXED, COMPOSITION: same as R9	745-1450-00
R60	RESISTOR, FIXED, COMPOSITION: 68,000 ohms, $\pm 10\%$, 1/2 w; Allen-Bradley type EB	745-1429-00
R61	RESISTOR, FIXED, COMPOSITION: same as R6	745-1436-00
R62	RESISTOR, FIXED, COMPOSITION: same as R6	745-1436-00
R63	RESISTOR, FIXED, COMPOSITION: same as R5	745-1422-00
R64	RESISTOR, FIXED, COMPOSITION: same as R60	745-1429-00
R65	RESISTOR, FIXED, COMPOSITION: same as R57	745-1478-00
R66	RESISTOR, FIXED, COMPOSITION: same as R10	745-1352-00
R67	RESISTOR, FIXED, COMPOSITION: same as R9	745-1450-00
R69		
R70	RESISTOR, FIXED, COMPOSITION: same as R32	745-1289-00
R71	RESISTOR, FIXED, COMPOSITION: 47,000 ohms, $\pm 3\%$, 5 w; Allen-Bradley type HB	747-0963-480
R72	RESISTOR, FIXED, COMPOSITION: 1500 ohms, $\pm 10\%$, 1/4 w; Allen-Bradley type CB	745-0755-00
R73	RESISTOR, FIXED, COMPOSITION: same as R9	745-1450-00
R74	RESISTOR, VARIABLE: composition; 500,000 ohms, $\pm 30\%$, 1/4 w; Chicago Telephone Supply Co., part no. LL6066	376-7201-00
R75	RESISTOR, FIXED, COMPOSITION: same as R57	745-1478-00
R76	RESISTOR, FIXED, COMPOSITION: same as R6	745-1422-00
R77	RESISTOR, FIXED, COMPOSITION: same as R10	745-1352-00
R78	RESISTOR, FIXED, COMPOSITION: same as R6	745-1436-00
R79	RESISTOR, FIXED, COMPOSITION: 8.2 megohms, $\pm 10\%$, 1/2 w; Allen-Bradley type EB	745-1517-00
R80	RESISTOR, FIXED, COMPOSITION: same as R6	745-1436-00
R81	RESISTOR, FIXED, COMPOSITION: same as R79	745-1517-00
R82	RESISTOR, FIXED, COMPOSITION: same as R5	745-1422-00
R83	RESISTOR, FIXED, COMPOSITION: same as R10	745-1352-00
R84	RESISTOR, FIXED, COMPOSITION: same as R57	745-1478-00
R85	RESISTOR, VARIABLE: composition; 500 ohms, $\pm 30\%$, 1/4 w; Chicago Telephone Supply Co., part no. LL6067	376-7202-00

SECTION 6
Parts List

ITEM	DESCRIPTION	COLLINS PART NUMBER
R86	RESISTOR, VARIABLE; composition; 10 meg-ohms, $\pm 40\%$, 1/4 w; Chicago Telephone Supply Co, part no. LL6071	376-7206-00
R87	RESISTOR, FIXED, COMPOSITION: same as R4	745-1338-00
R88	RESISTOR, FIXED, COMPOSITION: 1500 ohms, $\pm 10\%$, 1/2 w; Allen-Bradley type EB	745-3359-00
R89	NOT USED	
R90	RESISTOR, FIXED, COMPOSITION: same as R4	745-1338-00
R91	RESISTOR, FIXED, COMPOSITION: same as R3	745-1464-00
R92	RESISTOR, FIXED, COMPOSITION: 47 ohms, $\pm 10\%$, 1/2 w; Allen-Bradley type EB	745-1296-00
R93	RESISTOR, FIXED, COMPOSITION: 8200 ohms, $\pm 10\%$, 2 w; Allen-Bradley type HB	745-5691-00
R94	RESISTOR, FIXED, COMPOSITION: same as R93	745-5691-00
R95	RESISTOR, FIXED, COMPOSITION: 100 ohms, $\pm 10\%$, 1/2 w; Allen-Bradley type EB	745-1310-00
R96	RESISTOR, FIXED, COMPOSITION: same as R3	745-1464-00
R97	NOT USED	
R98	RESISTOR, VARIABLE; composition; 5 megohms, $\pm 30\%$, 0.2 w; Chicago Telephone Supply type 70	376-4629-00
R99	RESISTOR, FIXED, COMPOSITION: 2.2 meg-ohms, $\pm 10\%$, 1/2 w; Allen-Bradley type EB	745-1492-00
R100	RESISTOR, FIXED, COMPOSITION: same as R9	745-1450-00
R101	RESISTOR, FIXED, COMPOSITION: same as R6	745-1436-00
R102	RESISTOR, FIXED, COMPOSITION: 47 ohms, $\pm 10\%$, 1/4 w; MIL type RC07GF470	745-0701-00
R103	RESISTOR, FIXED, COMPOSITION: 15,000 ohms, $\pm 10\%$, 2 w; Allen-Bradley type HB	745-5701-00
R104	RESISTOR, FIXED, COMPOSITION: same as R92	745-1296-00
R105	RESISTOR, FIXED, COMPOSITION: same as R40	745-1394-00
R106	RESISTOR, FIXED, COMPOSITION: 22,000 ohms, $\pm 10\%$, 1/2 w; Allen-Bradley type EB	745-1408-00
R107	RESISTOR, FIXED, COMPOSITION: same as R40	745-1394-00
R108	NOT USED	
R109	RESISTOR, FIXED, COMPOSITION: same as R92	745-1296-00
R110	RESISTOR, FIXED, COMPOSITION: same as R3	745-1464-00
R111	RESISTOR, FIXED, COMPOSITION: same as R3	745-1464-00
R112	NOT USED	
R113	RESISTOR, FIXED, WIREWOUND: 1750 ohms, $\pm 10\%$, 3 w; IRC part no. PW3-1750-10	710-9183-00
R114	RESISTOR, FIXED, WIREWOUND: 15,000 ohms, $\pm 10\%$, 7 w IRC type PW7	710-9001-00
R115	NOT USED	
R116	RESISTOR, FIXED, COMPOSITION: same as R95	745-1310-00
R117	RESISTOR, FIXED, COMPOSITION: same as R6	745-1436-00
R118	RESISTOR, FIXED, COMPOSITION: same as R57	745-1478-00
R119	P/O Z4	
R120	P/O Z5	
R121	RESISTOR, FIXED, COMPOSITION: 47 ohms, $\pm 10\%$, 2 w; Allen-Bradley type HB	745-5596-00
R122	RESISTOR, FIXED, COMPOSITION: same as R121	745-5596-00
R123	RESISTOR, VARIABLE; composition; 1 megohm, $\pm 30\%$, 0.2 w; Chicago Telephone Supply type 70	376-4630-00
R124	RESISTOR, FIXED, COMPOSITION: same as R5	745-1422-00
R125	RESISTOR, FIXED, COMPOSITION: same as R5	745-1422-00
R126	RESISTOR, FIXED, COMPOSITION: same as R58	745-1415-00
R127	RESISTOR, FIXED, COMPOSITION: same as R92	745-1296-00
R128	NOT USED	
R129	RESISTOR, FIXED, COMPOSITION: same as R38	745-1380-00
R130	RESISTOR, FIXED, COMPOSITION: same as R102	745-0701-00
R131	RESISTOR, VARIABLE; composition; 250,000 ohms, $\pm 20\%$, 1/4 w; Chicago Telephone Supply	376-2698-00
R132	RESISTOR, FIXED, COMPOSITION: same as R95	745-1310-00
R133	RESISTOR, FIXED, COMPOSITION: same as R95	745-1310-00
R134	RESISTOR, FIXED, COMPOSITION: same as R92	745-1296-00
R135	RESISTOR, FIXED, COMPOSITION: same as R95	745-1310-00
R136	RESISTOR, FIXED, COMPOSITION: same as R95	745-1310-00
R137	RESISTOR, FIXED, COMPOSITION: same as R21	745-3296-00
R138	RESISTOR, FIXED, COMPOSITION: same as R5	745-1422-00
*R139	RESISTOR, FIXED, COMPOSITION: same as R38	745-1380-000
*R139	RESISTOR, FIXED, COMPOSITION: 5600 ohms, $\pm 10\%$, 1/2 w; MIL Type RC20GF562K	745-1384-000
*R139	RESISTOR, FIXED, COMPOSITION: 6800 ohms, $\pm 10\%$, 1/2 w; MIL Type RC20GF682	745-1387-000
*R139	RESISTOR, FIXED, COMPOSITION: 8200 ohms, $\pm 10\%$, 1/2 w; MIL Type RC20GF822	745-1391-000
*R139	RESISTOR, FIXED, COMPOSITION: 10,000 ohms, $\pm 10\%$, 1/2 w; MIL Type RC20GF103	745-1394-000
*R139	RESISTOR, FIXED, COMPOSITION: 12,000 ohms, $\pm 10\%$, 1/2 w; MIL Type RC20GF123	745-1398-000
R140	RESISTOR, FIXED, WIREWOUND: 34,000 ohms, $\pm 3\%$, 5 w; Dale Products part no. RS5-34001H	747-0983-470
R141	RESISTOR, FIXED, COMPOSITION: 68 ohms, $\pm 10\%$, 1/2 w; MIL Type RC20GF560	745-1303-000

*Chosen per operational requirements

ITEM	DESCRIPTION	COLLINS PART NUMBER
R142	RESISTOR, FIXED COMPOSITION: same as R4	745-1338-00
R143	RESISTOR, FIXED COMPOSITION: same as R139	745-1394-00
R144	RESISTOR, FIXED COMPOSITION: 15,000 ohms, $\pm 10\%$, 1/2 w; Allen-Bradley type EB	745-1401-00
R145	RESISTOR, FIXED, COMPOSITION: 220 ohms, $\pm 10\%$, 1/4 w; MIL type RC07GF221	745-0725-00
R146	RESISTOR, FIXED, COMPOSITION: same as R145	745-0725-00
S1	SWITCH SECTION, ROTARY: 1 circuit (1 pole), 14 positions, 1 section; 1 moving contact, 8 fixed contacts; Oak Mfg. Co, part no. 88127-CK	269-1980-00
S2	SWITCH SECTION, ROTARY: same as S1	269-1980-00
S3	SWITCH SECTION, ROTARY: same as S1	269-1980-00
S4	SWITCH SECTION, ROTARY: 2 circuit (2 pole), 14 positions; 2 moving contacts, 17 fixed contacts; Oak Mfg. Co, part no. 88216-CK	269-1983-00
S5	SWITCH SECTION, ROTARY: 1 circuit (1 pole), 14 positions, 1 section; 1 moving contact, 10 fixed contacts; Oak Mfg. Co, part no. 88128-CK	269-1981-00
S6	SWITCH SECTION, ROTARY: 1 circuit (1 pole), 14 positions, 1 section; 1 moving contact, 6 fixed contacts; Oak Mfg Co, part no. 88130-CK	269-1982-00
S7	SWITCH, ROTARY: 2 circuit, (2 pole), 3 positions, 1 section; 2 moving contacts, 8 fixed contacts Oak Mfg. Co, part no. 188004-F1	259-0955-00
S8	SWITCH, ROTARY: 10 circuit (10 pole) 5 positions, 5 sections; 2 moving contacts, 12 fixed contacts; Oak Mfg. Co, part no. 225173-F5	259-1628-00
S9	SWITCH, ROTARY: 8 circuit (8 pole) 4 positions, 2 sections; 8 moving contacts, 32 fixed contacts, Oak Mfg. Co, part no. 88002-JK2AC	259-0953-00
S10	P/O R74	
S11	SWITCH ROTARY: 1 circuit (1 pole) 14 positions, 1 moving contact, 15 fixed contacts; Oak Mfg. Co, part no. 192796-CK	269-2023-00
S12	P/O R8	
S13	SWITCH SUBASSEMBLY: miniature telephone relay type stack switch; 2A 1C contact arrangement; 3 amp, 300 w, ac noninductive; Switchcraft, Inc, part no. XA-12566	266-0131-00
S14	NOT USED	
S15	NOT USED	
S16	HV INTERLOCK ASSEMBLY, INCLUDES: Spring shorting Terminal lug Eyelet Terminal standoff	554-0467-002 304-0014-00 307-1091-00 306-0976-00 278-1712-00
T1	TRANSFORMER, COIL ASSEMBLY: IF, transformer w/center tapped primary; 3,055 ac center frequency; ± 200 -kc tuning range; Communications Coil Co, part no. X-001-2X-002-2	278-0696-00
T2	TRANSFORMER, INTERMEDIATE FREQUENCY: 455-kc center frequency; 440-kc to 470 kc tuning range; 300 v rms; Communications Coil Co, part no. X-682-1	
V1	ELECTRON TUBE: triode-pentode; Radio Corp. of America part no. 6U8A	255-0328-00
V2	ELECTRON TUBE: same as V1	255-0328-00
V3	ELECTRON TUBE: pentode, Radio Corp of America part no. 6CB6	255-0207-00
V4	ELECTRON TUBE: glass envelope, twin triode, Radio Corp. of America part no. 12AT7	255-0205-00
V5	ELECTRON TUBE: same as V4	255-0205-00
V6	ELECTRON TUBE: pentode; Radio Corp. of America part no. 6AH6	255-0191-00
V7	ELECTRON TUBE: power pentode; RCA part no. 6CL6	255-0216-00
V8	ELECTRON TUBE: beam power, pentode; Sylvania part no. 6146A	256-0149-00
V9	ELECTRON TUBE: same as V8	256-0149-00
V10	ELECTRON TUBE: twin diode; Tung-Sol Electric, Inc, part no. 6AL5	257-0018-00
V11	ELECTRON TUBE: same as V1	255-0328-00
V12	ELECTRON TUBE: pentode; same as V3	255-0207-00
V13	ELECTRON TUBE: voltage regulator; Radio Corp. of America part no. OA2	257-0052-00
V14	ELECTRON TUBE: same as V4	255-0205-00
Y1	CRYSTAL UNIT, QUARTZ: 6555,000 kc frequency; Midland Mfg. Co, Inc, part no. 9009	290-9009-00
Y2	CRYSTAL UNIT, QUARTZ: 6755,000 kc frequency; Midland Mfg. Co, Inc, part no. 9010	290-9010-00
Y3	CRYSTAL UNIT, QUARTZ: 6955,000 kc frequency; Midland Mfg. Co, Inc, part no. 9011	290-9011-00
Y4	CRYSTAL UNIT, QUARTZ: 10155,00 kc frequency; Midland Mfg. Co, Inc, part no. 9027	290-9027-00
Y5	CRYSTAL UNIT, QUARTZ: 10355,00 kc frequency; Midland Mfg. Co, Inc, part no. 9028	290-9028-00
Y6	CRYSTAL UNIT, QUARTZ: 8577,500 kc frequency; Midland Mfg. Co, Inc, part no. 9062	290-9062-00

SECTION 6

Parts List

ITEM	DESCRIPTION	COLLINS PART NUMBER
Y7	CRYSTAL UNIT, QUARTZ: 8677.500 kc frequency; Midland Mfg. Co. Inc. part no. 9063	290-9063-00
Y8	CRYSTAL UNIT, QUARTZ: 12077.50 kc frequency; Midland Mfg. Co. Inc. part no. 9097	290-9097-00
Y9	CRYSTAL UNIT, QUARTZ: 12177.50 kc frequency; Midland Mfg. Co. Inc. part no. 9098	290-9098-00
Y10	CRYSTAL UNIT, QUARTZ: 12277.50 kc frequency; Midland Mfg. Co. Inc. part no. 9099	290-9099-00
Y11	CRYSTAL UNIT, QUARTZ: 15827.50 kc frequency; Midland Mfg. Co. Inc. part no. 9201	290-9201-00
Y12	CRYSTAL UNIT, QUARTZ: 453.650 kc frequency; Midland Mfg. Co.	290-8705-00
Y13	CRYSTAL UNIT, QUARTZ: 456.350 kc frequency; Midland Mfg. Co.	290-8706-00
Z1	SUPPRESSOR, PARASITIC: 2 turns no. 18 AWG; 47 ohms, 2 w	544-3125-002
Z2	SUPPRESSOR, PARASITIC: same as Z1	544-3125-001
Z3	SUPPRESSOR, PARASITIC: 6 turns no. 22 AWG; 33 ohms, 1/2 w	545-6146-00
Z4	SUPPRESSOR, PARASITIC: 4 turns no. 20 AWG; 47 ohms, 1/2 w	548-8217-00
Z5	SUPPRESSOR, PARASITIC: same as Z4	548-8217-00
70K-2 OSCILLATOR		522-1093-00
*C301	CAPACITOR, FIXED, CERAMIC, DIELECTRIC: 20 uuf ± 1 uuf, 500 vdc; -400 $\pm 15\%$ temperature coefficient; Centralab Div. of Globe-Union, Inc. part no. DA933-002	913-0053-00
*C301	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 20 uuf ± 1 uuf, 500 vdc; -600 $\pm 15\%$ temperature coefficient; Centralab Div. of Globe-Union, Inc. part no. DA933-005	913-0054-00
*C301	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 20 uuf ± 1 uuf, 500 vdc; -800 $\pm 15\%$ temperature coefficient; Centralab Div. of Globe-Union, Inc. part no. DA933-007	913-0055-00
*C301	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 20 uuf ± 1 uuf, 500 vdc; -1000 $\pm 15\%$ temperature coefficient; Centralab Div. of Globe-Union, Inc. part no. DA933-008	913-0056-00
*C301	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 20 uuf ± 1 uuf, 500 vdc; -1200 $\pm 15\%$ temperature coefficient; Centralab Div. of Globe-Union, Inc. part no. DA934-017	913-0057-00
*C301	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 20 uuf ± 1 uuf, 500 vdc; -1400 $\pm 15\%$ temperature coefficient; Centralab Div. of Globe-Union, Inc. part no. DA934-018	913-0058-00
*C301	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 20 uuf ± 2 uuf, 500 vdc; -1600 $\pm 15\%$ temperature coefficient; Centralab Div. of Globe-Union, Inc. part no. DA934-023	913-0232-00
*C301	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 20 uuf ± 2 uuf, 500 vdc; -1800 $\pm 15\%$ temperature coefficient; Centralab Div. of Globe-Union, Inc. part no. DA934-024	913-0233-00
*C301	CAPACITOR, FIXED, CERAMIC, DIELECTRIC: 20 uuf ± 2 uuf, 500 vdc; -2000 $\pm 15\%$ temperature coefficient; Centralab Div. of Globe-Union, Inc. part no. DA934-025	913-0234-00
*C301	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 20 uuf ± 2 uuf, 500 vdc; -2200 $\pm 15\%$ temperature coefficient; Centralab Div. of Globe-Union, Inc. part no. DA934-026	913-0235-00
C302	CAPACITOR, FIXED, MICA: 1.000 uuf $\pm 1\%$ 500 v dc; Electro Motive part no. DM20F102F-500WV	912-1749-00
C303	CAPACITOR, FIXED, MICA: 3000 uuf, $\pm 1\%$ 500 vdc; Electro Motive Mfg. Co. part no. DM20F302F-500WV	912-1748-00
C304	CAPACITOR, FIXED, MICA: 200 uuf $\pm 1\%$ 300 v dc; Electro Motive part no. DM15E201F-300WV	912-3468-00
*C305	CAPACITOR, FIXED, CERAMIC: 100 uuf $\pm 2\%$ 500 v dc; Centralab part no. DA932-005	913-0074-00
*C305	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 100 uuf ± 2 uuf, 500 vdc; -2000 $\pm 15\%$ temperature coefficient; Centralab Div. of Globe-Union, Inc. part no. DA933-016	912-0244-00
*Chosen per operational requirements		

ITEM	DESCRIPTION	COLLINS PART NUMBER
C306	CAPACITOR, FIXED, CERAMIC: 0.02 uf -40% +60%, 250 v dc; Sprague Electric Co. part no. 20C109	913-2097-00
C307	CAPACITOR, FIXED, CERAMIC: same as C306	913-2097-00
C308	CAPACITOR, VARIABLE, CERAMIC: 5.0 uuf min. to 37.5 uuf max., 350 v dc; Erie Resistor Corp. part no. 557018 COPO 39R	917-1073-00
C309	CAPACITOR, FIXED, CERAMIC: same as C306	
C310	CAPACITOR, FIXED, CERAMIC: same as C306	
C311	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 10 uuf ± 1 uuf, 500 vdc; 0 ± 30 PPM temperature coefficient; Centralab Div. of Globe-Union, Inc. part no. DA933-001	913-0043-00
CR301	SEMICONDUCTOR DEVICE, DIODE: germanium; Sylvania part no. 1N34A	353-0103-00
H301	WASHER, FLAT: brass, cadmium plated, 0.218 in. id, 0.375 in. od, 0.031 in. thk	503-4964-001
H302	LEADSCREW: brass, chrome plated; rh spiral groove, 8 turns per in., 1 in. lg; 0.187 in. dia by 2.962 in. lg	543-7332-003
H303	WASHER, STOP: steel, cadmium plated; 0.191 in. id, 0.500 in. od, 0.164 in. thk; 1/8 in. w by 0.094 in. lg stop	542-5438-002
H304	WASHER, KEY: steel, cadmium plated; 0.191 in. id, 0.500 in. od, 0.253 in. h; 0.075 in. w by 0.093 in. lg prbent key	543-7328-002
H305	NUT, PLAIN, HEXAGON: brass, nickel plated; 4-40 NC-2 thd, 3/16 in. by 1/16 in. Pheoil Mfg. Co.	313-0156-00
H306	WASHER, FLAT: stainless steel; passivate finish; 0.120 in. id, 0.203 in. od, 0.025 in. thk	540-3022-003
L301	TRIMMER ASSEMBLY: 9 turns #28 AWG; 1 toroid coil and hardware	543-7323-00
L302	TRIMMER ASSEMBLY: same as L301	
L303	COIL, RADIO FREQUENCY: 10 turns no. 30 AWG; single layer wound	543-7333-003
L304	COIL, RADIO FREQUENCY: angle layer wound, magnet wire 3.30 uh; Communications Coil Co.	240-0695-00
MP301	BALL, GLASS: pyrex; 0.125 in. dia; Hartford Steel Ball Co. Inc.	309-0778-00
MP302	COVER, OSCILLATOR: aluminum; 1.978 in. by 2.180 in. by 2.500 in. excl hardware	543-7321-00
MP303	COVER REAR, OSCILLATOR: aluminum, chromate dipped; 5/8 in. by 2-3/16 in. by 3-1/4 in.	543-7329-002
MP304	CONTACT, ELECTRICAL: copper, gold plated; 0.250 in. by 0.673 in. by 1.030 in.	542-5439-002
MP305	COLLAR, STOP: cres. gold plated; 0.375 in. dia by 0.171 in. w	542-5437-001
MP306	PLATE, REAR: CRES. passivate finish; 0.078 in. thk; 1 in. dia	542-5441-002
R301	RESISTOR, FIXED, COMPOSITION: 0.10 megohms $\pm 10\%$, 1/2 w; Allen Bradley Co. type EB	745-1436-00
R302	RESISTOR, FIXED, COMPOSITION: 82,000 ohms $\pm 5\%$, 1/2 w; Allen Bradley Co. type EB	745-1432-00
R303	RESISTOR, FIXED, COMPOSITION: same as R301	
T301	TRANSFORMER, RADIO FREQUENCY: pri 380 uh nom; 790 kc; sec 2.7 uh nom; 2.6 me; Delevan Electronics	240-0665-00
V301	ELECTRON TUBE: sharp cutoff pentode; RCA 7543	257-0301-00
XV301	SOCKET, TUBE: turret type, 7 pin miniature; 1-3/32 in. by 1-5/8 in. lg; Eby, Hugh H., Inc. part no. 9737-95	220-1189-00

SECTION 6
Parts List

GENERAL COVERAGE CRYSTALS AVAILABLE											
CRYSTAL FREQUENCY (kc)	FOR	OPERATING FREQUENCY (mc)	PART NUMBER	CRYSTAL FREQUENCY (kc)	FOR	OPERATING FREQUENCY (mc)	PART NUMBER	CRYSTAL FREQUENCY (kc)	FOR	OPERATING FREQUENCY (mc)	PART NUMBER
*6555.000		3.4-4.6	290-9009-00	8277.500		13.4-13.6	290-9059-00	12877.500		22.6-22.8	290-9105-00
*6755.000		3.6-3.8	290-9010-00	8377.500		13.6-13.8	290-9060-00	12977.500		22.8-23.0	290-9106-00
*6955.000		3.8-4.0	290-9011-00	8477.500		13.8-14.0	290-9061-00	13077.500		23.0-23.2	290-9107-00
7155.000		4.0-4.2	290-9012-00	*8577.500		14.0-14.2	290-9062-00	13177.500		23.2-23.4	290-9108-00
7355.000		4.2-4.4	290-9013-00	*8677.500		14.2-14.4	290-9063-00	13277.500		23.4-23.6	290-9109-00
7555.000		4.4-4.6	290-9014-00	8777.500		14.4-14.6	290-9064-00	13377.500		23.6-23.8	290-9110-00
7755.000		4.6-4.8	290-9015-00	8877.500		14.6-14.8	290-9065-00	13477.500		23.8-24.0	290-9111-00
7955.000		4.8-5.0	290-9016-00	*8977.500		14.8-15.0	290-9066-00	13577.500		24.0-24.2	290-9112-00
9755.000		6.6-6.8	290-9025-00	9077.500		15.0-15.2	290-9067-00	13677.500		24.2-24.4	290-9113-00
9955.000		6.8-7.0	290-9026-00	9177.500		15.2-15.4	290-9068-00	13777.500		24.4-24.6	290-9114-00
*10155.000		7.0-7.2	290-9027-00	9277.500		15.4-15.6	290-9069-00	13877.500		24.6-24.8	290-9115-00
*10355.000		7.2-7.4	290-9028-00	9377.500		15.6-15.8	290-9070-00	13977.500		24.8-25.0	290-9116-00
10555.000		7.4-7.6	290-9029-00	9477.500		15.8-16.0	290-9071-00	14077.500		25.0-25.2	290-9117-00
10755.000		7.6-7.8	290-9030-00	9577.500		16.0-16.2	290-9072-00	14177.500		25.2-25.4	290-9118-00
10955.000		7.8-8.0	290-9031-00	9677.500		16.2-16.4	290-9073-00	14277.500		25.4-25.6	290-9119-00
11155.000		8.0-8.2	290-9032-00	9777.500		16.4-16.6	290-9074-00	14377.500		25.6-25.8	290-9120-00
11355.000		8.2-8.4	290-9033-00	9877.500		16.6-16.8	290-9075-00	14477.500		25.8-26.0	290-9121-00
11555.000		8.4-8.6	290-9034-00	9977.500		16.8-17.0	290-9076-00	14577.500		26.0-26.2	290-9122-00
11755.000		8.6-8.8	290-9035-00	10077.500		17.0-17.2	290-9077-00	14677.500		26.2-26.4	290-9123-00
11955.000		8.8-9.0	290-9036-00	10177.500		17.2-17.4	290-9078-00	14777.500		26.4-26.6	290-9124-00
12155.000		9.0-9.2	290-9037-00	10277.500		17.4-17.6	290-9079-00	14877.500		26.6-26.8	290-9125-00
12355.000		9.2-9.4	290-9038-00	10377.500		17.6-17.8	290-9080-00	14977.500		26.8-27.0	290-9126-00
12555.000		9.4-9.6	290-9039-00	10477.500		17.8-18.0	290-9081-00	15077.500		27.0-27.2	290-9127-00
12755.000		9.6-9.8	290-9040-00	10577.500		18.0-18.2	290-9082-00	15177.500		27.2-27.4	290-9128-00
12955.000		9.8-10.0	290-9041-00	10677.500		18.2-18.4	290-9083-00	15277.500		27.4-27.6	290-9129-00
13155.000		10.0-10.2	290-9042-00	10777.500		18.4-18.6	290-9084-00	15377.500		27.6-27.8	290-9130-00
13355.000		10.2-10.4	290-9043-00	10877.500		18.6-18.8	290-9085-00	15477.500		27.8-28.0	290-9131-00
13555.000		10.4-10.6	290-9044-00	10977.500		18.8-19.0	290-9086-00	15527.500		27.9-28.1	290-9142-00
13755.000		10.6-10.8	290-9045-00	11077.500		19.0-19.2	290-9087-00	15577.500		28.0-28.2	290-9132-00
13955.000		10.8-11.0	290-9046-00	11177.500		19.2-19.4	290-9088-00	15627.500		28.1-28.3	290-9143-00
14155.000		11.0-11.2	290-9047-00	11277.500		19.4-19.6	290-9089-00	15677.500		28.2-28.4	290-9133-00
14355.000		11.2-11.4	290-9048-00	11377.500		19.6-19.8	290-9090-00	15727.500		28.3-28.5	290-9144-00
14555.000		11.4-11.6	290-9049-00	11477.500		19.8-20.0	290-9091-00	15777.500		28.4-28.6	290-9134-00
14755.000		11.6-11.8	290-9050-00	11577.500		20.0-20.2	290-9092-00	15827.500		28.5-28.7	290-9201-00
14955.000		11.8-12.0	290-9051-00	11677.500		20.2-20.4	290-9093-00	15877.500		28.6-28.8	290-9135-00
7577.500		12.0-12.2	290-9052-00	11777.500		20.4-20.6	290-9094-00	15927.500		28.7-28.9	290-9145-00
7677.500		12.2-12.4	290-9053-00	11877.500		20.6-20.8	290-9095-00	15977.500		28.8-29.0	290-9136-00
7777.500		12.4-12.6	290-9054-00	11977.500		20.8-21.0	290-9096-00	16027.500		28.9-29.1	290-9146-00
7877.500		12.6-12.8	290-9055-00	*12077.500		21.0-21.2	290-9097-00	16077.500		29.0-29.2	290-9137-00
7977.500		12.8-13.0	290-9056-00	*12177.500		21.2-21.4	290-9098-00	16127.500		29.1-29.3	290-9147-00
8077.500		13.0-13.2	290-9057-00	*12277.500		21.4-21.6	290-9099-00	16177.500		29.2-29.4	290-9138-00
8177.500		13.2-13.4	290-9058-00	12377.500		21.6-21.8	290-9100-00	16227.500		29.3-29.5	290-9148-00
				12477.500		21.8-22.0	290-0101-00	16277.500		29.4-29.6	290-9139-00
				12577.500		22.0-22.2	290-9102-00	16327.500		29.5-29.7	290-9149-00
				12677.500		22.2-22.4	290-9103-00	16377.500		29.6-29.8	290-9140-00
				12777.500		22.4-22.6	290-9104-00	16477.500		29.8-30.0	290-9141-00

*Indicates crystals furnished with 32S-3.

SECTION 6
Parts List

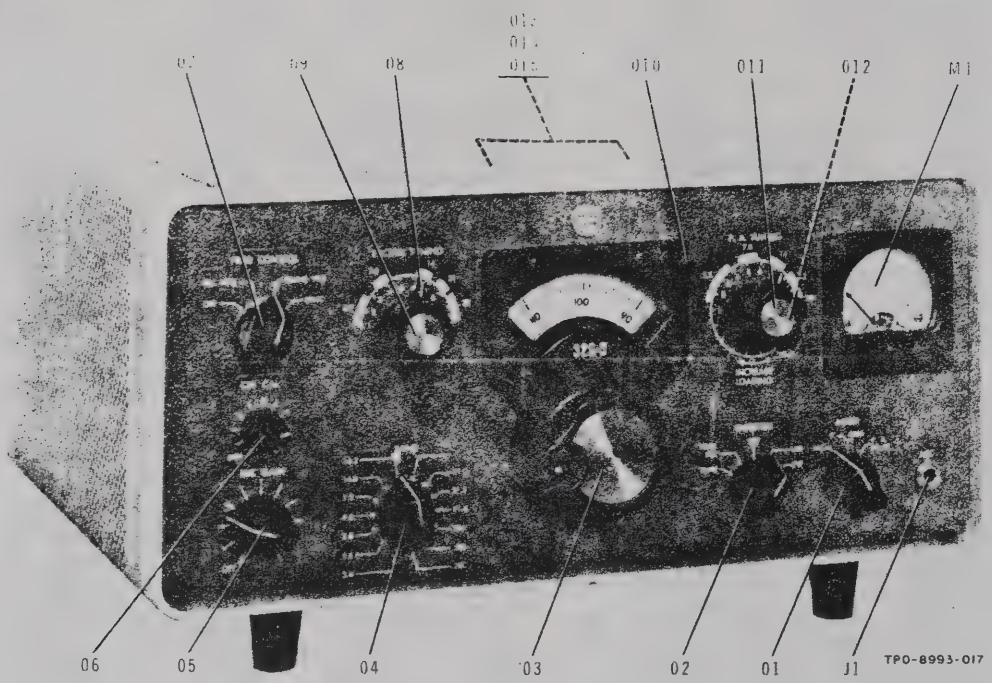


Figure 6-1. Location of Knobs

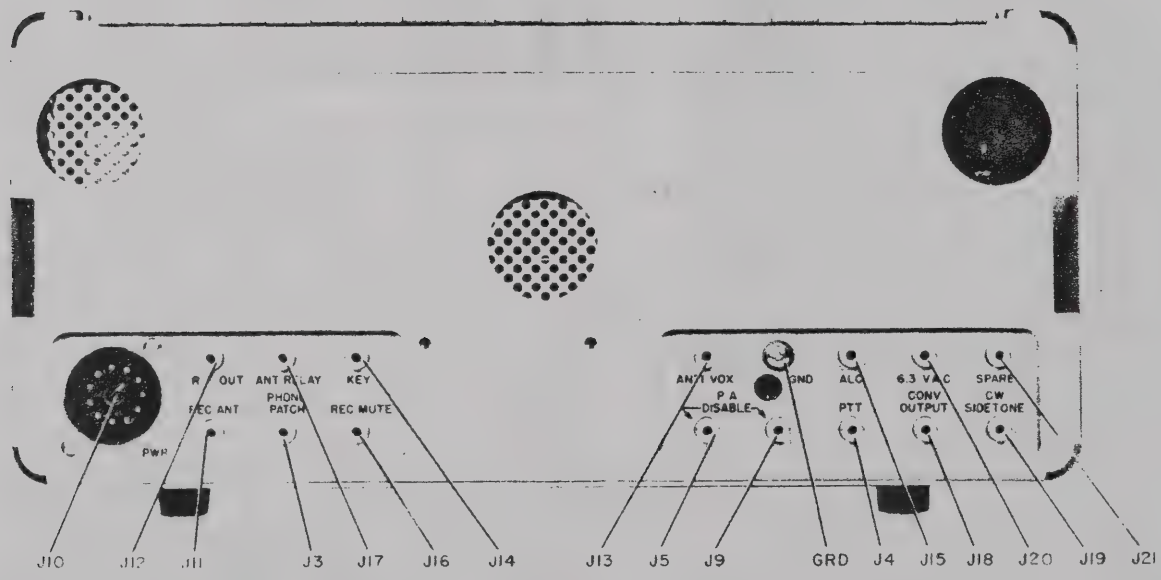


Figure 6-2. Location of Jacks

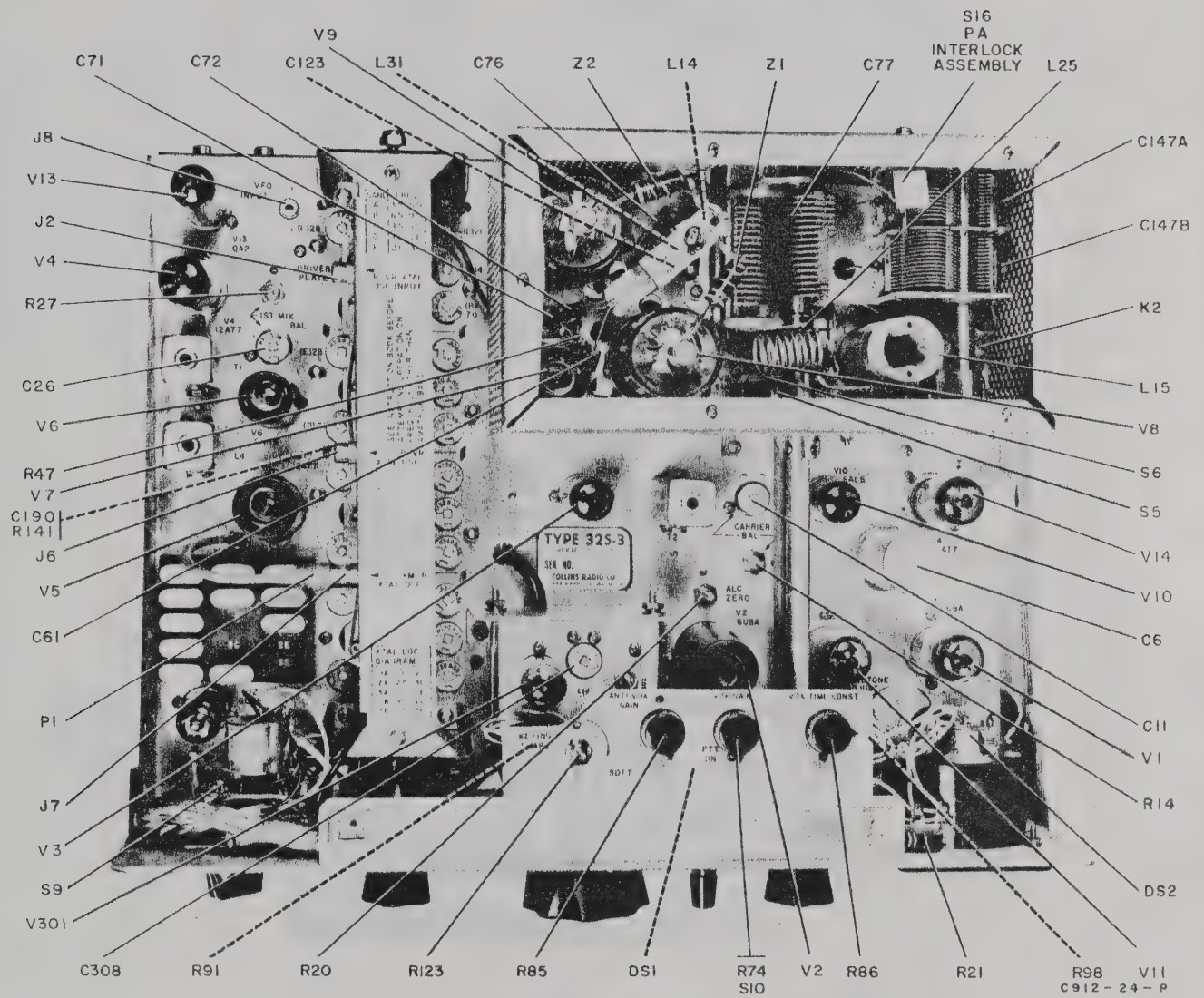


Figure 6-3. Top Chassis Parts Location

SECTION 6
Parts List

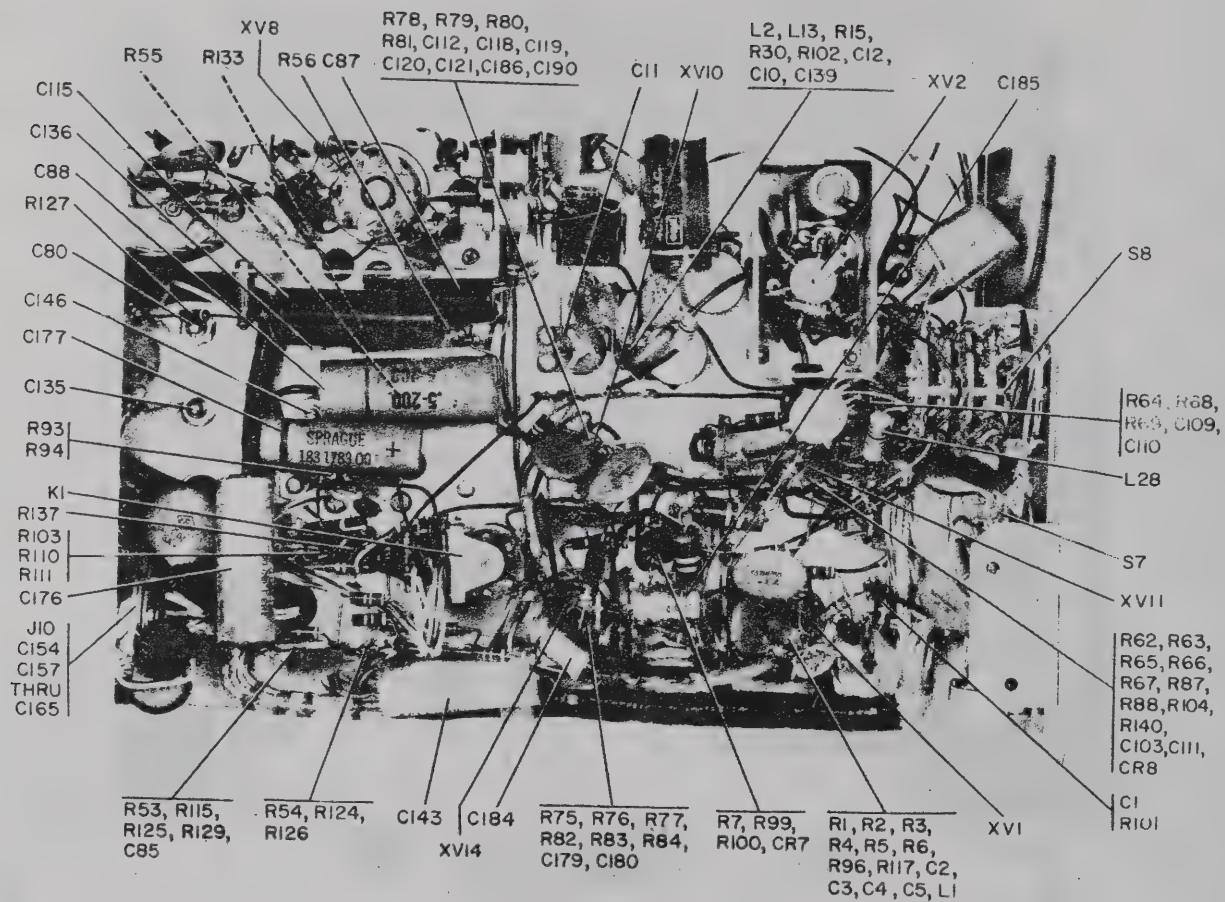


Figure 6-4. Under Chassis Parts Location, Left Side

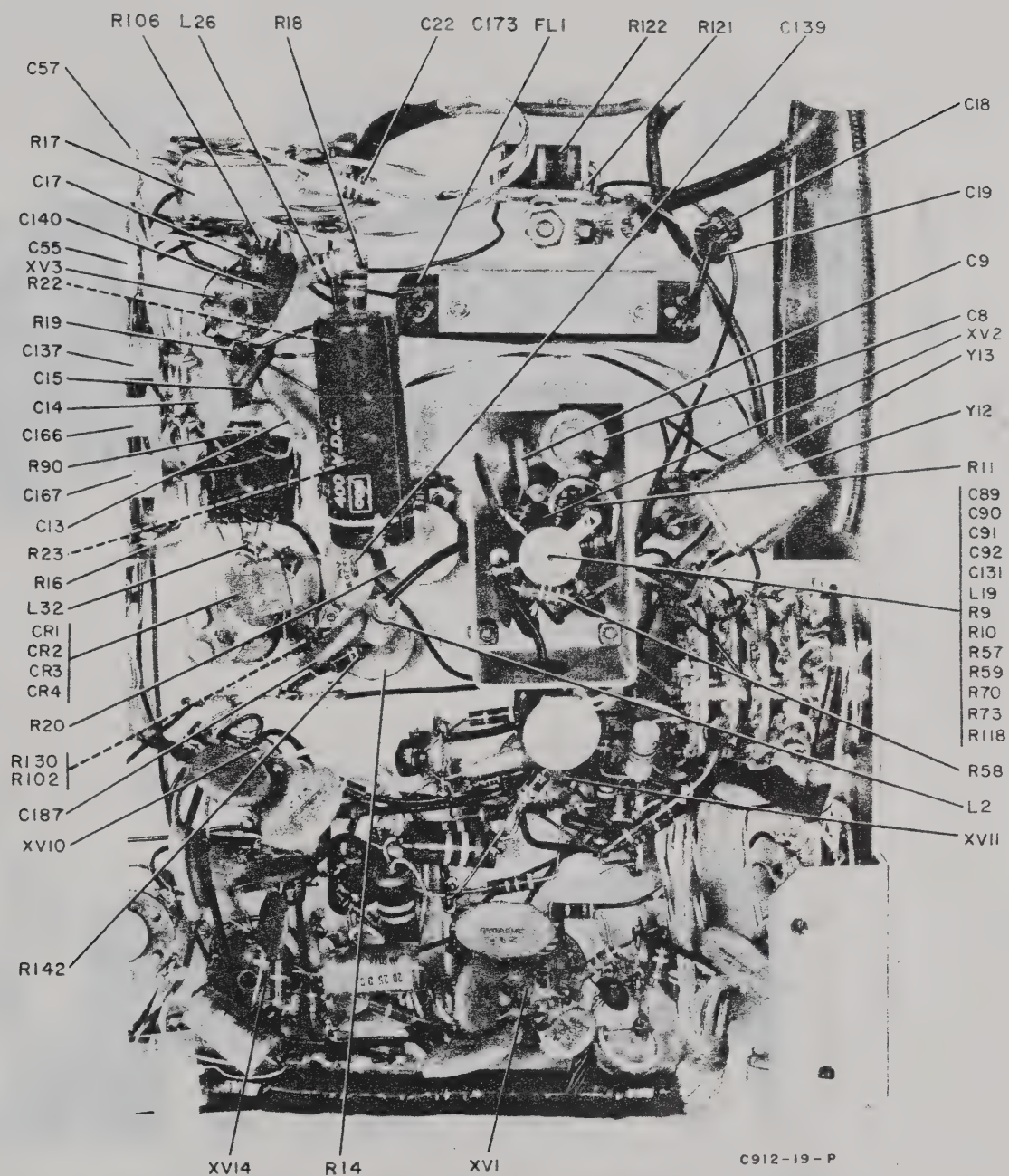


Figure 6-5. Under Chassis Parts, Location, Center Front

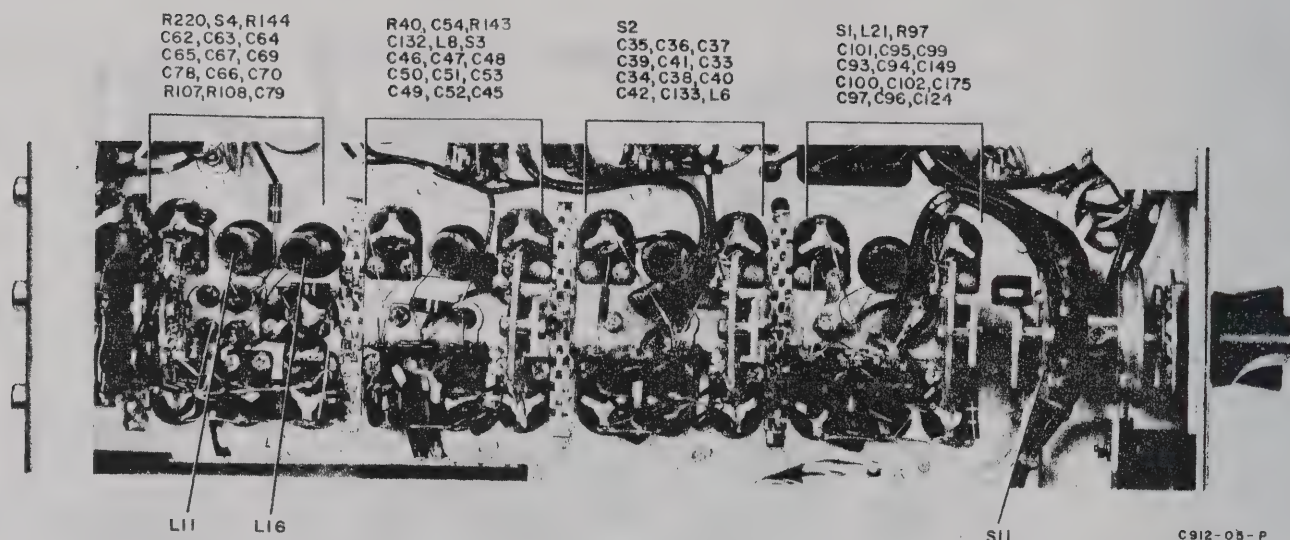


Figure 6-7. Band Switch Section, Parts Location

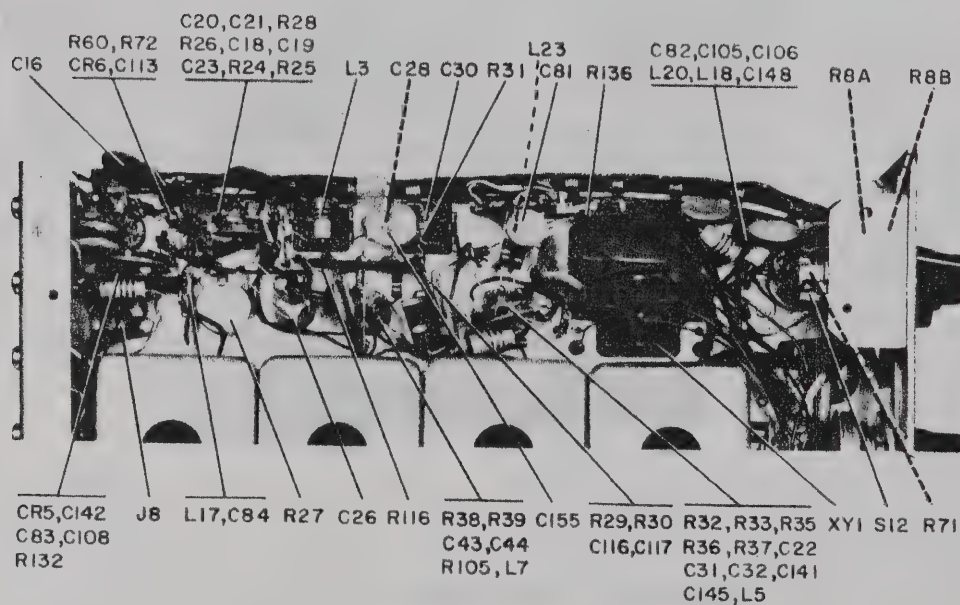
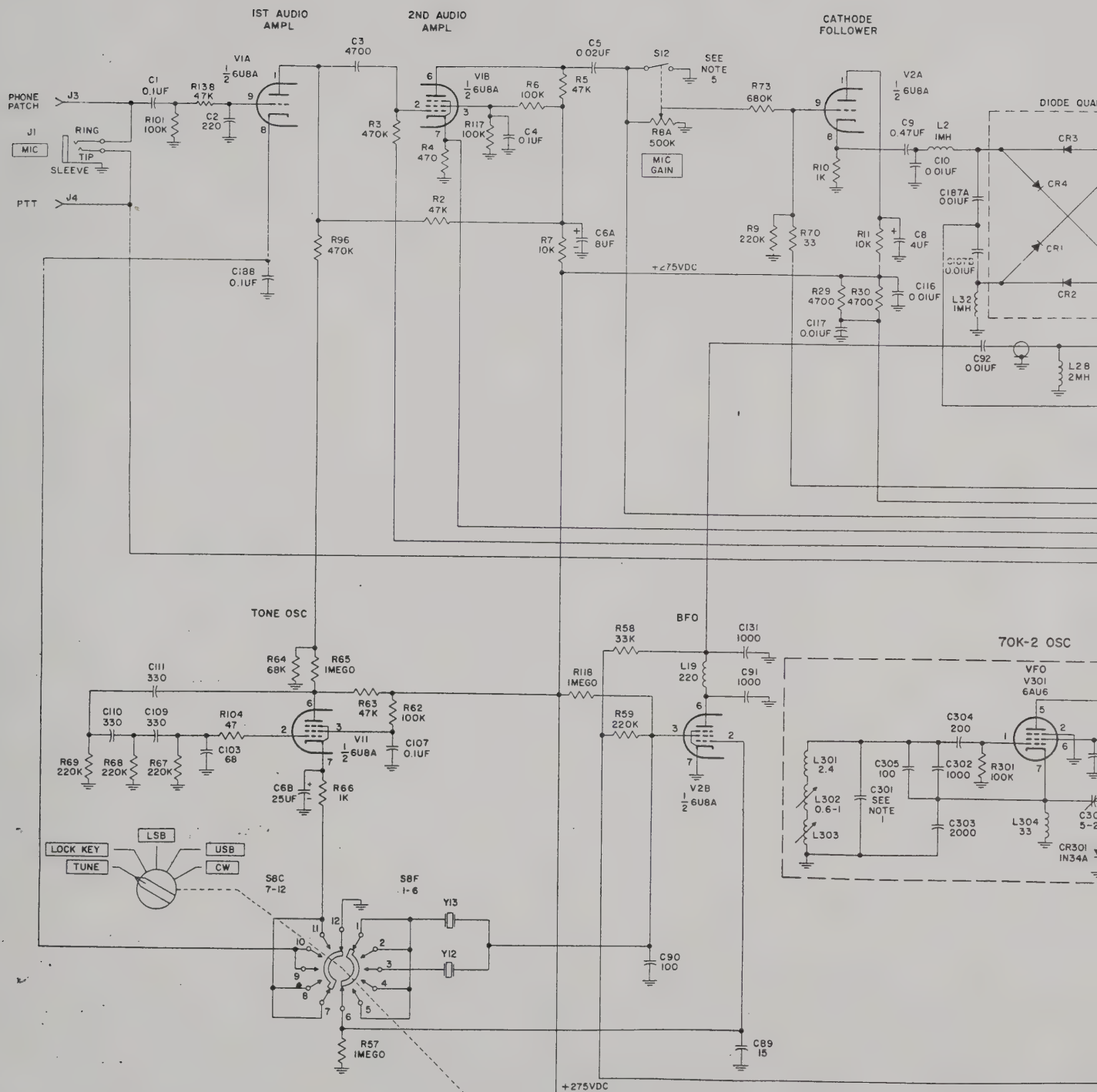
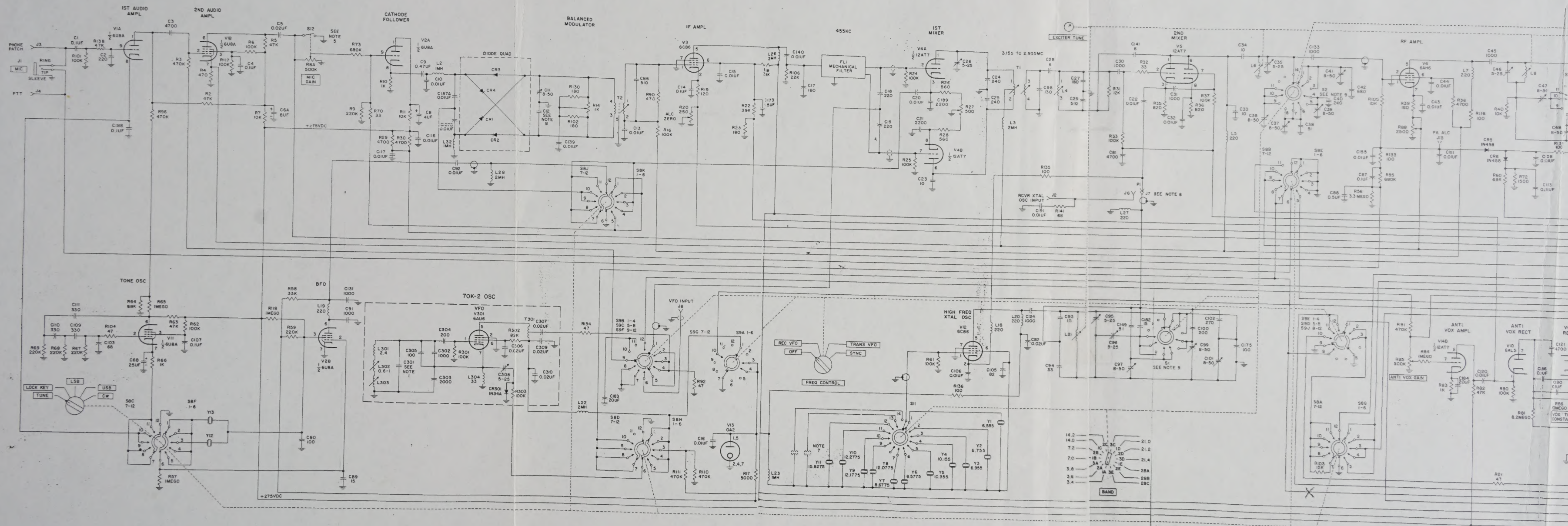


Figure 6-8. Under Chassis Parts Location, Right Side





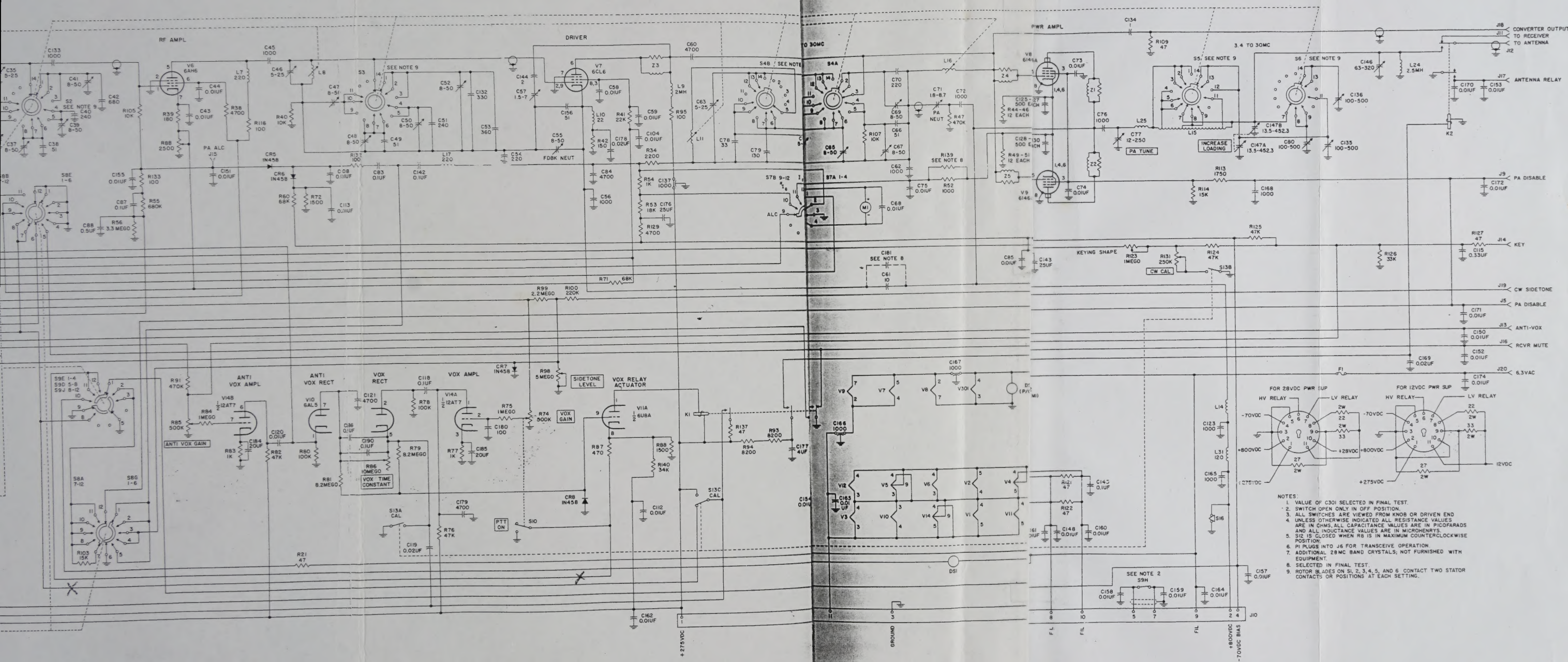


Figure 7-1. 32S-3 Transmitter, Schematic Diagram

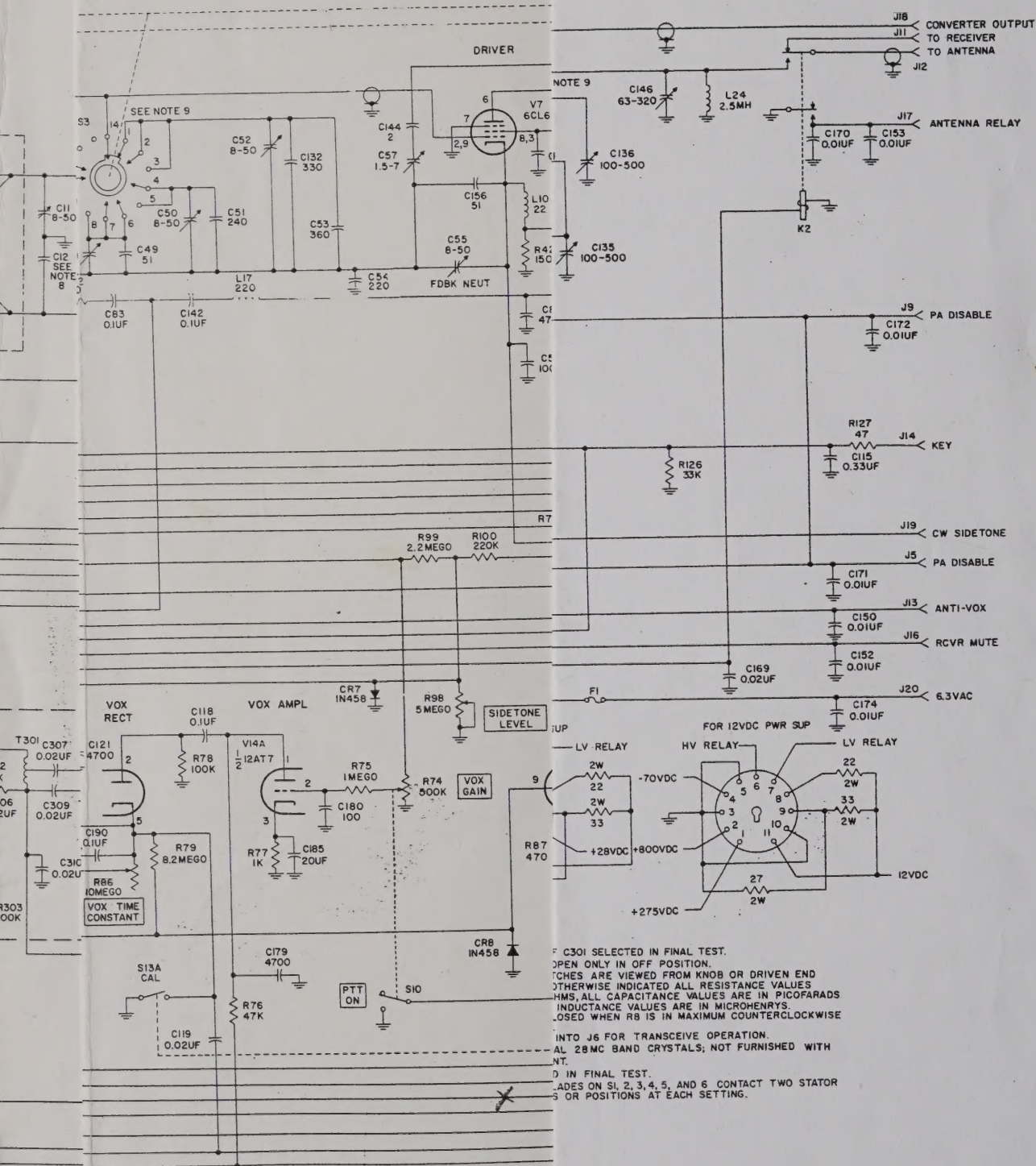


Figure 7-1. 32S-3 Transmitter, Schematic Diagram